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ECONOMIC GEOGRAPHY

APRIL

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Karol J. Kucinski and Walter S. Eisenmenger

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SUPERIOR FARMERS

NUMEROUS distinctions can readily be made among the farmers of our country, of any country. Farming is so varied an industry, is founded upon so varied resources and affected by so varied conditions, and is followed by so varied types of folk and person that in every group of farmers there is the widest diversity as to aptitude, character, and crop.

In any farming community, whatever conditions prevail, some farmers surpass their fellows by sheer superiority of farming skill and ability. On any kind of soil, on any degree of relief, under any amount of rainfall, with any kind of crop or system of tillage, some farmers succeed, some fail, some endure a precarious living, some enjoy abundance and even luxury. The regional standard of living may be high or low, but whatever it be, some folk in the region will live in better circumstances than others. The diversity represents differences in aptitude, or skill, or luck, of the individual farmers.

But throughout our land are clustered many island, or oasis, groups of farmers, possessing a group, or community, superiority of skill and energy, and successful harvests. Coöperatively they have developed a superior system of farming, a superior technique, that yields them superior harvests, superior means, and superior standards of living. Be the soil, or rainfall, or transportation, or market what it may, they make superior use of it and produce superior crops. They are the superior farmers of our great agricultural estate.

ECONOMIC GEOGRAPHY

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AGRICULTURAL-CULTURAL ISLANDS IN THE SOUTH—PART II

Walter M. Kollmorgen

PART I of this paper (October 1941) was a thumb-nail description of a series of cultural-agricultural islands visited in the South in the summer of 1937. As little interpretative material could be presented in Part I, this article is an attempt partly to remedy this deficiency.

Surprise was expressed by some readers at the number of cultural-agricultural islands described; others thought that many more such islands exist and that they are larger in size than was indicated. However, as was pointed out, many islands were not visited, in particular those west of the Mississippi River and south of the Cotton Belt proper. Moreover, not all cultural islands are agricultural-cultural, nor do they all illustrate agricultural potentialities with respect to diversification and other constructive farming practices. For this reason, many interesting groups, such as the Cajuns, were excluded from the reconnaissance, although these groups do have distinct ethnic backgrounds.

During the last fifty years some of the extensive agricultural development of the South has taken place in Florida and along the Gulf Coast, particularly in the valley of the Rio Grande River. In-migration to these places has been heavy and many of the new settlers came from the North. The extent to which these settlers from the North, with their program of fruit and vegetable farming, represent cultural-agricultural islands has not been sufficiently investigated to warrant definite conclusions.

Exaggerated impressions concerning the number and size of cultural-agricultural islands in the Cotton Belt proper may readily be gained from casual reading on the subject. (See, for instance, Walter L. Fleming, "Immigration to the Southern States," *Political Science Quarterly*, Vol. XX, 1905, pp. 276–297.) Prior to the Civil War, the popular and governmental attitude in the South was one of outright opposition to extensive immigration. Later this changed so completely that state money was spent to advertise cheap lands and agricultural opportunities in the South. In time, the railroads also shifted the locale of the Promised Land from the West to the South. The impression is gained that the response to this advertising was comparable—or nearly so—to the tidal-wave migration

that wiped out the western frontier.

Excursion trains and special trains apparently did transport many land-hungry and curious travelers to the South, but sooner or later many of these same travelers again went North, to stay. Many settlements were short lived. The West, especially beyond the 100th meridian, held many surprises for the home seekers who had been regaled with descriptions of a land of wealth and plenty. Immigrants to the South, who had usually enjoyed a similar fare, likewise frequently found serious adverse experiences awaiting them. There the problem was not drouth, but poor, infertile stretches of land—land on which no known methods of intensive farming assured a satisfactory level of living. This was particularly true in the days when the nature and use of commercial fertilizer were understood by comparatively few and when many sections with poor roads were remote from railroads. Consider, for instance, the Appalachian Plateau from southern Tennessee northward. Enticing descriptions and advertising of this plateau attracted many hundreds of thrifty farmers from the North and abroad. Scores of settlements were started, but few survived even a decade. In the state of Tennessee alone this area is a vast graveyard of local agricultural aspirations. This fate of hopeful immigrants to the South is by no means unique.

Literature pertaining to the German settlement in Cullman County, Alabama, provides a good example of exaggeration concerning the number of immigrants that established an island community. Chiefly through the influence of a German by the name of Cullman, between 2,000 and 2,500 German settlers came to what is now Cullman County between 1872 and 1900. Those who came early in the 1870's were the first non-squatter settlers in the area that now makes up the county. Shortly after the first Germans arrived, a heavy influx of settlers came from nearby areas, and particularly from the Piedmont section of Georgia. In 1940, the county had a population of 47,343, of which the Germans and their descendants constituted a small minority, numbering fewer than 3,000 because of heavy out-migration. (See *The German Settlement in Cullman County, Alabama; An Agricultural Island in the Cotton Belt*, Bureau of Agricultural Economics, U. S. Dept. of Agriculture, Washington, D. C., 1941.)

It is interesting to note the metamorphosis of accounts on the number of German settlers in the county. In a publication entitled *Northern Alabama* (1888) it is stated that Cullman "brought into the State and located over 100,000 people." (P. 384.) The writer fails to say whether these were Germans only or whether the figure includes other immigrants from neighboring areas and states. Since Mr. Cullman directed his promotion activities chiefly to the Middle West and abroad, most subsequent writers have assumed and reported that he brought 100,000 Germans into the state of Alabama. It is so reported in *The Cullman Democrat* of March 19, 1931, and *The Cullman Tribune* of September 28, 1939. In recent decades, the statement concerning the 100,000 Germans has been often repeated and a Master's thesis prepared for the University of Alabama (1937) adds that "the majority of these settled in Cullman County!" (See also *The Book of Alabama and the South*, John Temple Graves II, ed., 1933, p. 78.)

Thus at least some of the reports concerning the migration of farmers into the South during the last half century are as trustworthy as the pre-

mature reports of Mark Twain's death.

In the light of the South's agricultural problems, its long-continued immigrant-promotion programs are rather remarkable. Some of these promotion activities ceased in the first and second decades of this century, but some states and companies continued in this work up to and even during the recent depression years. In recent years when we were constantly reminded of the land pressure and associated problems in the South, Tennessee and Louisiana and perhaps other states, were issuing publications inviting farmers to settle on available productive farms. During the writer's survey to locate agricultural islands in the South, in 1937, scores of county agricultural agents and several state representatives spoke of the great opportunities in their localities awaiting the "right kind" of immigrant farmer. This seemed paradoxical in terms of the wealth of literature describing the rural South as over-populated. But the emphasis was always on the "right kind" of farmer. This term did not necessarily mean farmers with any considerable amount of money; it meant those immigrant farmers who would carry on diversification in some form, would not engage in landlord-tenant farming, would avoid credit farming, and would build good improvements and develop the land.

It is surprising that the implications of these assumptions have been so completely unexplored by students of agriculture. One of these implications was the conviction that immigrant farmers would somehow perpetuate a pattern of farming that was in some ways different from and more desirable than local agricultural practices. In other words, it was assumed that agricultural patterns have a tendency to project themselves. Yet these assumptions have so far found practically no place in the tomes of accepted agricultural literature. Its general thesis is that the agricultural landscape is determined by economic opportunities and the physical environment. But is this entirely true?

The presence today of a considerable number of cultural-agricultural islands in the South suggests that the belief concerning the persistence of agricultural patterns is warranted. Of the several scores of such islands visited by the writer in the summer of 1937, none had been completely absorbed into a one-cash-crop or cotton economy. Although evidence on this point is incomplete, all immigrant communities appear either to have worked out some program of diversified farming which frequently included cotton or they failed altogether and abandoned their holdings.

The term "projection of agricultural patterns" should not be interpreted to mean that immigrant groups transplanted unmodified types of farming from their original homelands to the South. Drastic changes were frequently necessary if they wished to survive on the poor lands to which they had been brought by settlement-promotion schemes. However, the ideal and practice of diversification survived, as did the ideals and realization of land ownership, fair to good land improvements, maintenance of good gardens, practice of food preservation, keeping of at least some livestock, willingness to work, avoidance of credit merchants, and absence of sharp social stratification within the group. While the islands differ in actual farming programs, collectively they have maintained important difference insofar as the much publicized problem South is concerned. This contrast suggests that the traditional picture is not inevitable in terms of environmental factors and economic opportunities.

The question may be raised as to what extent maps on types of farming reflect the presence of cultural islands. Maps of states and of the United States are usually so generalized that the presence of these islands is obscured or even obliterated. Most of the islands here considered are so small that their qualities of uniqueness are lost when data are used on the county level. Within the county, their presence is readily established by type-of-farming data.

However, not all type-of-farming maps on the state and national level obliterate cultural groups as identified by distinctive programs of farming. Several such groups may be recognized on the map entitled "Type of Farming Areas in the United States: 1930" issued with the U. S. Bureau of the Census publication *Types of Farming in the United States* (1933). In farming area No. 299 in southern Louisiana, designated as the "Louisiana strawberry area," the most prominent cultural group is a large settlement of Italians from southern Italy, and smaller Hungarian and German settlements are also found in the area. It is these people who produce the bulk of the strawberry crop in this type-of-farming area. Area 347a, labeled "Gulf Coast—Dairy, truck, fruit," extends along the Gulf of Alabama, Mississippi, and Louisiana. In the Alabama portion of this type-of-farming area—the only part covered in the reconnaissance—the farming program which characterizes the area was definitely introduced and developed by northern immigrants. These immigrants included former nationals of Greece, Sweden, Italy, France, Poland, and Germany.

Type-of-farming areas No. 259a, "Southwest Louisiana-Texas—Rice, some cotton," and No. 288, "Grand Prairie, Arkansas—Rice," also mark cultural-agricultural islands. Shortly before 1900 the discovery was made, by northern farmers it is claimed, that these flat lands underlain by hardpan were well adapted to rice culture with large machine tools. Subsequently, in response to promotional work, a heavy influx of farmers from the Middle West took place, and rice farming expanded rapidly. In Louisiana, Cajuns also adopted this type of farming in time but apparently few cotton growers, especially large operators, responded to the opportunity of growing rice. Their failure to do so cannot be explained fully in terms of economic considerations. The rice culture developed by northern farmers was too completely foreign to the cotton farmers. Consider, for instance, such culture obstacles as lack of familiarity with large machinery, the difficulty of farming with tenants who knew little or nothing about raising rice, and other barriers relating to work programs.

The rice-growing sections in the South offer a splendid opportunity of studying culture in terms of agriculture. How exclusively the introduction and development of the rice industry in these States may be credited to northern farmers, and how exclusively it has remained the activity of these farmers and their descendants would be significant information. Why did the Cajuns of Louisiana respond more readily to the adoption of this type of farming than the cotton growers? Obviously, certain elements in the culture-potential of the Cajuns were more favorable to the adoption of rice farming than the culture-potentials of the cotton growers. Only through studies of this kind can the dynamics of the morphology of landscape be understood.

Cultural influences in changing types of farming in the South—or elsewhere, for that matter—are by no means limited to cultural islands as that term is used

here. In some places immigrant individuals, by example and encouragement, provided the stimulus which in time greatly modified patterns of farming. Two such type-of-farming areas are No. 295, "Copiah County—Truck (tomatoes)," and No. 291, "Humboldt—Cotton, truck, strawberries, sweet potatoes," in the states of Mississippi and Tennessee respectively.

The origin of the tomato industry in Copiah County, Mississippi, is credited to several Italian and German immigrants, who were too few in number to constitute a community. Credit is also given to the Illinois Central Railroad, which for many years promoted immigration to the South and greatly encouraged diversification and the production of early truck crops in the Gulf area. Like some land-promotion companies, it acted partly on the assumption that different and new types of farming are realized more quickly by introducing immigrant farmers. Lastly, the influence of the state colleges of agriculture and the Extension Service of the United States Department of Agriculture should not be overlooked. In time, these organizations no doubt played a dominant rôle in the expansion and improvement of the truck crop industry. However, this inquiry is concerned with the genesis of particular type-of-farming areas, and in this respect the cultural factor of immigrants was in many cases more significant than the influence of formal organizations.

The origin of type-of-farming area No. 291, mainly in Gibson County, Tennessee, seems to have been somewhat similar to that of Copiah County, Mississippi. In a recent study, "Truck Farming in the Northern Part of the Cotton Belt—Gibson County, Tennessee" (*Journal of the Tennessee Academy of Science*, 1941, pp. 266–289), it is reported: "Truck farming started in this area just after the close of the Civil War (1867) when two immigrants from Maryland began growing strawberries. From these two men some of the natives learned how to grow strawberries and soon other truck crops were introduced."

That practical examples of raising new crops under actual farming conditions should serve as good teaching devices seems plausible. While farmers generally have long considered the agricultural experiment stations as valuable and essential, many nevertheless hold that production programs in these stations are not wholly comparable to those carried on by individual farmers, whose help and means are usually more limited. This belief not infrequently serves as a barrier between traditional farming practices and innovations which seem desirable and profitable to professional agriculturists.

Much remains to be learned concerning acculturation processes accompanying the introduction of new patterns of farming by transplanted cultural groups. For instance, under what circumstances are new techniques and patterns transmitted to traditional farmers, and, conversely, under what circumstances do cultural barriers confine the new techniques and patterns to the transplanted group? These situations should be viewed in relative and not in absolute terms. In Part I of this paper it was pointed out that some cultural islands in the South have maintained their identity for a century and even longer. Cultural identity, however, does not exclude some dispersion of unlike farming practices and ways of living.

Careful investigation in some islands and observation in others indicate that transplanted programs of farming, which are usually modified to meet new conditions, spread outward from islands most rapidly under conditions of crisis. The

term "crisis" is here used in a total sense and is not confined to material implications. This means that prevailing value systems must also be taken into account, and these may reach a threshold of realization and action at unlike points in a continuum from good to bad farming practices from one generation to another and even from one decade to another. At present, for instance, farmers in the South are much more aware of critical agricultural problems confronting them than they have been at any time in the past. This widespread awareness in turn has stimulated many action programs designed to ameliorate conditions. But this more general awareness of problems is not fully the product of recent findings and recent educational programs. As much as a century ago southern writers decried erosion, the one-cash-crop system, and dependence on credit merchants. Improved methods of communication and transportation, together with other changes, have greatly facilitated educational programs. This change, it is reasonable to believe, has facilitated acculturation and has made cultural factors more fluid. This does not mean that the tendency of cultural projection has been or is being cancelled, but that cultural qualities have been somewhat less static—although they are never completely static.

Examples of changed agricultural practices resulting from crises are numerous. In a general way the present agricultural changes in the South constitute an agricultural revolution which is breaking up reliance on a one-cash-crop system. Changed marketing conditions resulted in an oversupply of cotton and a disastrously low price for the product. These facts constitute important elements in the crisis confronting the South. To varying degrees, the boll weevil created a serious crisis for many cotton farmers one or several decades ago. In southern Alabama this plague led to the introduction of peanut farming and to other changes. In the Black Belt of Alabama, livestock farming is expanding. In the coastal section of Georgia and South Carolina the weevil played havoc with the long-staple cotton industry and many former cotton plantations are now truck farms.

Agricultural innovations resulting from crises or those accompanying the establishment of immigrant cultural groups have taken place independently, but crises serve to accelerate dispersion of superior farming practices from cultural islands to neighboring areas. Crises create a degree of cultural instability, and it is during such periods that conditions are most favorable for change.

There is danger of drawing unwarranted conclusions from the fact that a rather impressive number of cultural-agricultural islands have been established in the South, with varying degrees of success. Just as the agriculturalist, economist, and geographer have overemphasized physical and economic factors in interpreting the South, the student of the social sciences may view and interpret the area merely in terms of culture and social institutions. The remark has been made that the problem South resolves itself largely in terms of culture complexes—that and little more! Impressions of this kind result from a dearth of information.

While numerous cultural-agricultural islands have survived in the South, in nearly every one the immigrant farmers went through great hardships in their period of adjustment. And it should be remembered that probably a great many more islands failed than succeeded. Many ended in failure because their sites were exceptionally poor. Other failures resulted from attempts to introduce unmodified Northern programs of

farming into the South. Grass-grain-stock farming as carried on in the North will not succeed in most places in the South, and it is precisely this kind of farming that many immigrants from the North tried to introduce into the Cotton Belt. While successful islands of agriculture in the South rely on some form of diversified farming, reliance is usually placed on a number of cash crops instead of livestock farming or large-scale machine farming.

Of the various groups that migrated to the Cotton Belt to engage in farming, the European peasant seems to have met with more success than the typical Yankee farmer. The latter too generally made heavy initial investments in land and machinery and stuck to his accustomed way of farming; a few crop failures or near failures led to financial difficulties and the end of a farming experiment.

Many of the agricultural islands in the South were established during the last half century, at a time when most of the good land in the Cotton Belt had long been in the hands of cotton and tobacco farmers. On the superior soils, mainly alluvial and limestone, plantation owners frequently prevailed and these lands definitely were not for sale to immigrant groups. On the contrary, during this period, most of the land-promotion schemes inviting farmers to come to Dixie offered some of the most infertile land in the South. The fact that much of this land was not cleared until a few decades ago suggests this.

Many a thrifty immigrant sought the Promised Land on the Cumberland Plateau, on the Barrens of Tennessee, on the sandy coastal plains, or on worn-out, eroded, and abandoned lands elsewhere. Only by liberal application of commercial fertilizer—a type of fertilizer some of them had never seen or used before—did some of these immigrants forestall complete disaster.

It seems unfortunate that not more of the cultural islands in the South were established on the better soils. Where programs of farming that were familiar to the immigrants were tried on good soils, they succeeded. This might have been true of many other places. Thus, after some adjustments and hardships, the German-Swiss in Franklin County, Tennessee, found that the limestone soils they occupied were suitable for the production of grains, grasses, and livestock. After a few years they had created a landscape with fields and improvements similar to those of the Middle West. (See *The German-Swiss in Franklin County, Tennessee; A Study of the Significance of Cultural Consideration in Farming Enterprises*, Bureau of Agricultural Economics, U. S. Dept. of Agriculture, Washington, D. C., 1940.) Perhaps a similar group would have succeeded as well or even better on the fertile alluvial soils along the Mississippi and its tributaries in the states of Mississippi or Arkansas, or elsewhere.

Since immigrant groups were usually directed to and settled on the fair to poorer soils of the South, methods of farming with which they were familiar had to be altered to meet new conditions. While one such community specializes in producing superior canteloupes, another in strawberries and sweet potatoes, and another in early truck crops, similar programs of farming cannot be recommended to and introduced by all farmers in the South. The important fact is that by deliberately seeking some form of diversified farming each community sooner or later developed a type of farming suited to its particular locality. There is no cure-all type of farming for the South to be learned from any one of the various island communities.

The close integration and coöperation of immigrant groups is closely associated with their successful introduction of new crops and different forms of agricultural improvements. If products are shipped to distant markets, quantity production is usually essential. By coöperation and coördinated effort this may be assured. In this respect, communities that are not so thoroughly integrated are at a distinct disadvantage. A practical first step many farmers can take to improve their agricultural and living conditions is to participate more actively in a program designed to revitalize their community. In this program churches and other institutions can play a significant part.

In none of the agricultural islands visited was tenancy a serious problem. Detailed statistics were gathered for three islands, namely, communities in Franklin County, Tennessee, Cullman County, Alabama, and Warren County, North Carolina. In each of these, more than 90 per cent of the farmers were owners or part-owners. According to local informants, land ownership was also high in other islands.

The fact that immigrant farmers in widely scattered places in the South are chiefly owners is significant. Here are people with distinct farming programs and ways of living who have made the agricultural ladder a reality in an area in which tenancy has long been taken pretty much for granted by both owners and tenants; here are communities of farmers of whom nearly all are making a success in tilling the soil without supervision by landlords; here are farmers who seek and attain a station in life which enables them to participate freely in community and state activities.

The high degree of ownership in the islands has several causes. Few if any of these farmers would have remained in the Cotton Belt if they had found it necessary to become croppers. The determination to become owners stimulated them to experiment with new crops, and many of these experiments were successful.

Diversification in itself does not assure land ownership. Witness, for instance, the Middle West. But in the South, farmers who diversify seem to enjoy a special advantage because land values are based largely on one or two cash crops; therefore farmers who diversify may realize a greater per-acre income, and with this income they may buy the land they occupy. On the other hand, if all the farmers in an area diversify, land prices may approach a level that cannot be paid by many tenants. Here again the problem should not be over-simplified. A better live-at-home program, more direct participation in farm work, and a resistance to the prevailing credit economy must also be taken into account.

In all of the immigrant communities there is a relatively more adequate program of living at home than in the Cotton Belt generally. Nearly all the island farmers keep cows and chickens and maintain large gardens. In none of them do the farmers contend that keeping a good garden interferes with essential farming operations. Field work in the islands and neighboring areas suggests that many of the traditional cash-crop farmers do not have good gardens because their food habits are such that they are satisfied without them. As part of their live-at-home program, the immigrant groups have long practiced the canning of food, whereas many of the housewives in the neighboring areas have only recently been taught how to can by the Extension Service and the Farm Security Administration.

Where Negroes are numerous, the traditional landowner class in the South

usually delegates much of the farm work to them, either as tenants or as laborers. The same practice of delegating work prevails toward poor whites operating as tenants. In the immigrant groups, on the other hand, owners and other farm operators take an active part in the farm work and as a result less work and responsibility are placed on others. The women also are largely self-sufficient in their work program. No social disapprobation is incurred by doing the family washing, cooking, and attending to other household tasks. The result is a high per capita productivity.

As these rather brief summarizations and conclusions on cultural-agricultural islands in the South indicate, there are excellent opportunities for further research on the significance of such island communities, not only in the South, but also in the North, the East, the West, and abroad.

THE PACIFIC NORTHWEST PEA INDUSTRY

Otis W. Freeman

THE pea industry of the Pacific Northwest is one of the leading specialty crops. Dry peas are grown for seed and other purposes, and green peas, mostly of the sweet variety, are canned. In addition, fresh peas are sold in season for local consumption and increasing quantities are frozen for winter use. The raising of seed peas has been carried on for many years and the bulk of the pea seed of the nation comes from the Pacific Northwest. In contrast, the pea canning industry has been important for only a few years. Oddly enough, the Palouse region of eastern Washington and adjacent sections of Idaho raises peas only for seed, not for canning, yet for a generation has furnished a majority of the seed peas planted for canning. On the other hand, the Blue Mountain district now processes over one-fifth of the canned peas of the country yet raises little pea seed for sale.

Dry Peas

The Palouse, a hilly region of about 2,500 feet elevation, with deep fertile soil, originally grass covered, lies in eastern Washington and western Idaho and has highly favorable conditions for peas. The same favorable conditions are found also in the Snake River Plain of southern Idaho. These two areas are the most important in the world for growing and marketing of seed peas. The production of dry peas for seed and food requires relatively cool temperatures during the blossoming season of the plants and immediately thereafter. Rainfall should be adequate but not excessive. Heavy rains favor the development of blights, mildews, and root rots of which the Palouse is fairly free. The months of May, June, and July in the Palouse have the required coolness and their rainfall of 18 to 24 inches annually is sufficient for peas. Late, killing frosts are not common. Rain is sparse during the harvest season which minimizes damage by shattering and weather conditions and also favors harvesting by combines with resulting reduced cost for raising the crop. Peas are planted as early in the spring as the weather permits and are harvested in early summer, a slack season for wheat farm labor. Peas are usually followed by winter wheat. The western Palouse region has less rain and peas were little grown outside the established eastern area, until 1941 and 1942. These years had cool, rainy summers, and experimental planting of peas in the western Palouse proved very successful and may be continued.

The leading crop in the Palouse is wheat which is usually raised alternately with summer fallow. Peas can be raised as an alternative crop instead of leaving the land fallow. They also benefit the soil by increasing its nitrogen content. In addition to fitting well into the cropping system in common use, peas can be grown by the same equipment, machinery, and methods by which wheat is produced. Little additional capital outlay by a wheat farmer is needed for raising peas. While natural conditions must be favorable for peas if the crop is to be profitable, various seed companies and dealers have actively encouraged expansion of the industry and should be given credit for much of the economic development.

Production of seed peas began about 1915 and, as a whole, the dry pea industry has been profitable in the eastern Palouse. The general trend in the last decade has been for the Palouse area and the Snake River Plain to replace older, dry pea-growing states like Wisconsin, Michigan, New York, and Colorado. Prevalence of plant diseases and declining yields in the areas formerly important are among the reasons for the shift.

That the growing of pea seed has become chiefly concentrated in the

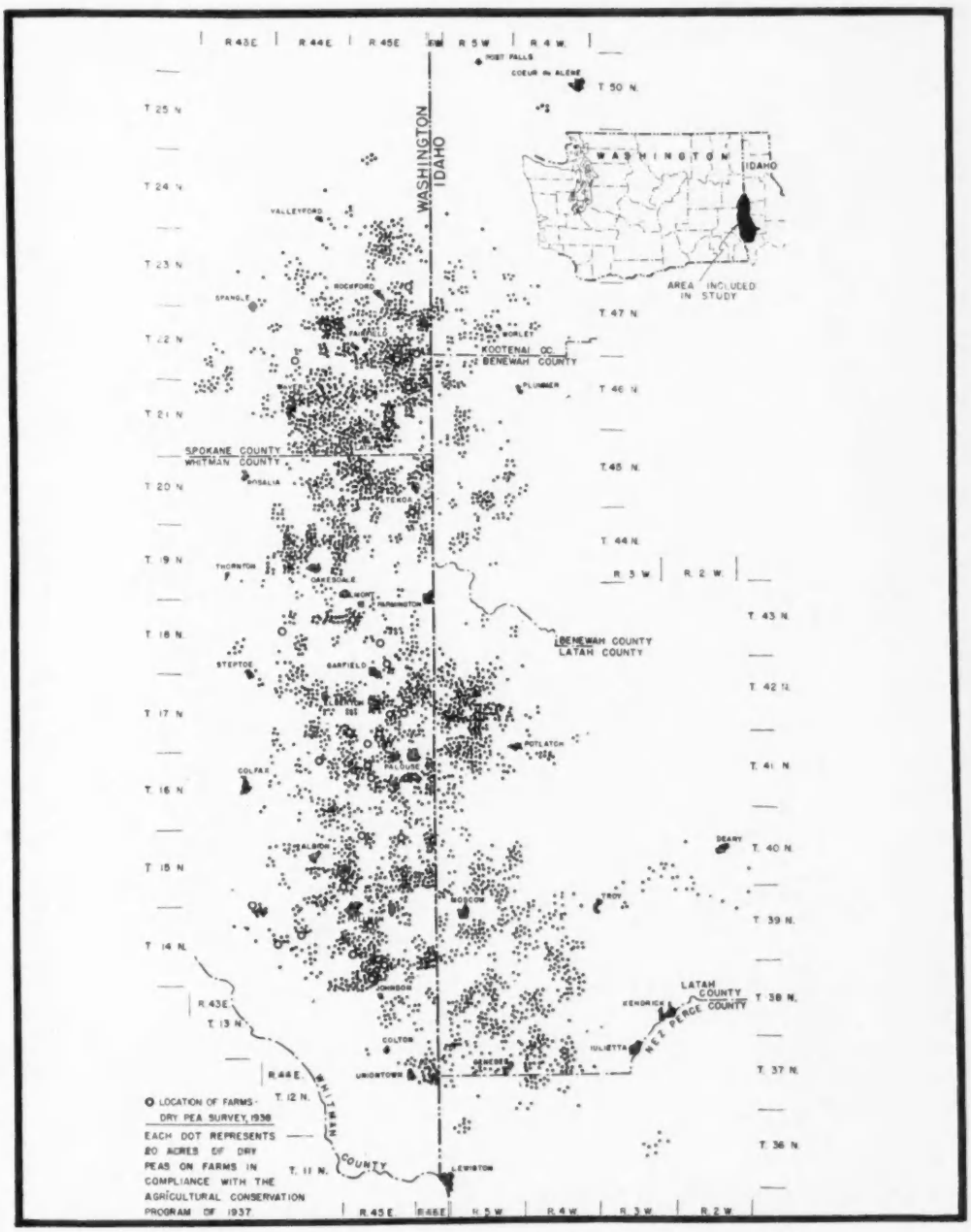


FIGURE 1.—Palouse dry pea area of Washington and Idaho, 1937.

Pacific Northwest is shown in *Farmer's Bulletin 1253* where the following estimates for the output of seed peas for 1937 were given.

TABLE I

	Pounds
Snake River Valley of southern Idaho	32,000,000
Palouse area of eastern Washington and northern Idaho	23,000,000
Bonners Ferry, Idaho	3,000,000
Western Washington, Ellensburg, Mount Vernon, and Puget Sound	2,000,000
Western Montana, Arlee, Hamilton, Kalispell, and Livingston	10,000,000
Gallatin Valley, Montana	7,000,000
Billings, Bridger, and Red Lodge, Montana, and Great Basin of Wyoming	7,000,000
Salinas, Sacramento, and King City, California	9,000,000
Total	93,000,000

The peas grown in California are raised as a winter crop. Elsewhere they are planted early in the spring and harvested in early summer.

The dry field and seed pea industry is highly concentrated. In the state of Washington in 1939 (census, 1940), there were 1,163 farms that reported the crop with a total of 84,531 acres. Of the farms, 765 had 79,013 acres planted to peas in the counties of Spokane and Whitman. However, growing was even more concentrated than county lines might indicate since only the eastern edge of the Palouse counties raise peas commercially. These Palouse farmers averaged 103 acres in peas per farm, while in four western Washington counties, Clallam, Island, Lewis, and San Juan, growers averaged 12 acres per farm. Two of these are island counties in Puget Sound. Columbia, near the Blue Mountains, had only four growers of seed peas, but they planted 895 acres. The Palouse region of Washington and Idaho is usually the most important dry pea producing area in the United States and in some years grows over one-half the entire output of the country. This position

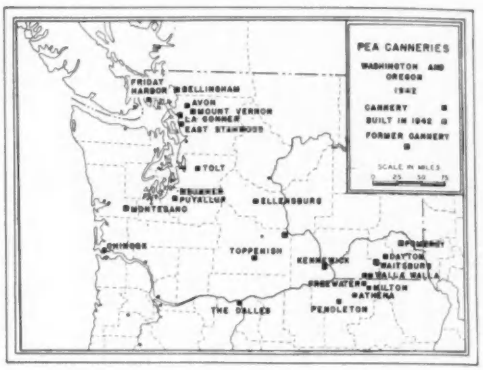


FIGURE 2.—Pea canneries, Washington and Oregon, 1942.

has been attained rather recently. In 1919 there were 29,000 acres, in 1929, 53,000 acres, and from 1934 to 1938 an average of 130,000 acres were in the crop. The average yield is close to 18 bushels of dry peas to the acre. The total production of peas in the Palouse region has approximated 2,500,000 bushels per year for the last eight years. These dry peas sold for about $1.00 per bushel on the farms. However, in 1942 the government guaranteed price was four and one-quarter cents per pound, nearly double the usual income. This high price has stimulated expansion of the industry. In 1942 the Palouse had 88 per cent more acreage in peas than in 1941. It is doubtful if the market can continue to absorb such a large increase in production after normal conditions return.

In Idaho, 19,262 acres of seed peas were raised on 1,232 irrigated farms and 19,908 acres on 526 "dry" farms (census, 1940), Benewah, Boundary, and Nez Perce counties, all in northern Idaho, raised most of the dry-land peas in the state. The irrigated seed peas are raised on the Snake River Plain in the neighborhood of Twin Falls and Idaho Falls. Yields per acre on irrigated land commonly exceed yields per acre from dry land.

Except in Flathead County, most of the seed peas raised in Montana are irrigated and come from the western mountain valleys.

Oregon showed a large increase in dry and seed peas in the decade 1930 to 1940. Growers increased from 119 to 1,125 and acreage from 2,278 to 32,225. Most of the Oregon crop, which is all non-irrigated, comes from the Willamette Valley.

Apparently the only reason that the Palouse and Snake Plain regions do not raise peas for canning is that the growers have not become interested. The grower of dry peas uses the same machinery that wheat requires. Growers of canning peas are strictly supervised and must learn correct methods of production. Most growers of dry and seed peas prefer to produce the crop with which they are familiar and resent supervision by outsiders. Sometime, however, the canning of peas should become an additional industry in the Palouse as conditions seem as favorable for green peas as for dry peas.

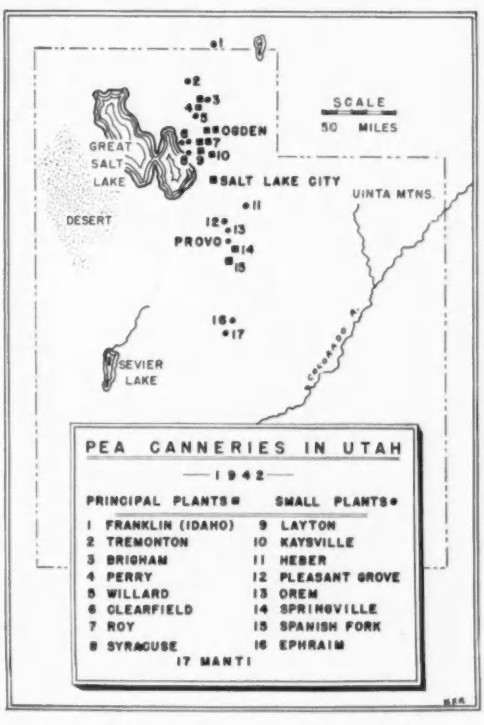


FIGURE 3.—Pea canneries in Utah, 1942.

Yields for canning in the Pacific Northwest usually total somewhat over one ton of shelled peas per acre. The yield of dry peas for seed is about one-half the weight of green peas and in volume usually averages between 16 and 20 bushels to the acre. Since about four bushels are planted to secure this yield, the increase is only four or five times the seed. This is much below that of wheat and most other crops. Nevertheless, in many years pea growers make good profits. In some years, growers of seed peas have found that it was more profitable to raise wheat than peas. However, peas planted in rotation with wheat have advantages that encourage their regular use as an alternative crop. A recent additional expense to growers is dusting the pea vines during the blossom season against weevil infestation. One of my students, who also runs a large farm, contracted to dust 4,000 acres in 1942.

If dry peas are not desired for seed, they may be ground and fed to livestock. The keeping of livestock to turn the surplus peas and roughage into low-cost by-product meat might well be expanded on most farms. Both sheep and hogs can utilize pea stubble to advantage. The stubble may be leased for grazing by sheep, but this is considered objectionable by some operators who state that the sheep often bring noxious weeds to infest the fields. Screenings and defective peas are also used for feeding livestock. Some peas are used for pidgeon feed.

Dry peas are used to some extent for human consumption. The Alaska variety especially is used for split peas in soups and other cooked foods.

Different varieties of peas have been

developed for various purposes and markets. Seed peas are generally raised by farmers under contract to dealers and jobbers. In 1937 there were 21 buyers of seed and commercial peas in the Palouse. However, some growers prefer to raise peas without a contract and depend on finding a market. Prices averaged $3.70 per hundredweight for cleaned peas in 1934 to a low of $1.05 in 1938. In 1942, the price was $4.25. Where planted under contract, the pea seed is furnished the grower who must deliver the entire crop to the dealer. The Alaska is the leading variety, followed by First and Best, Early Sweet, Surprise, and Perfection. Where weevil infestation has occurred, peas are tested in a brine solution in which the sound peas sink and defective peas float and can be removed. About 10 per cent of the peas are thus separated. Another 10 to 12 per cent of the seed peas are retained for planting in the Palouse. Wisconsin is the leading outside market for seed peas for canning, followed by New York, Washington, Oregon, Minnesota, and Michigan.

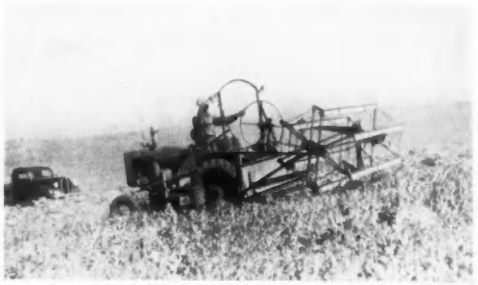


FIGURE 4.—Harvesting peas with a mowing machine fitted with vine-lifting and windrowing devices. (Courtesy of Blue Mountain Canneries, Inc.)

CANNING PEAS

The canning of peas is a highly specialized industry. Soil and climate must favor the pea crop. Labor must be available for raising and harvesting. Since peas after threshing are highly perishable, the cannery should be in the middle of a producing area with good highways that permit rapid delivery of the product from the farms. Factory labor is an important item, so canneries are usually located in cities and towns large enough to supply most of the working force required. Another practical consideration is the possibility of

TABLE II

WESTERN PACK OF CANNED PEAS IN CASES

Year	*Utah*	*Wash.*	*Ore.*	*Idaho*	*Wyo.-Mont.*	*Total, West, inc. California*	*Total U. S.*
1923	911,187	24,557	.....	10,000	.....	1,169,667	13,948,000
1924	734,751	95,115	.....	13,446	.....	1,085,610	19,315,000
1925	1,313,048	168,495	.....	21,000	.....	1,773,270	17,816,000
1926	1,029,000	87,643	.....	21,000	.....	1,351,154	17,709,000
1927	725,000	126,459	.....	12,500	267,889	1,184,762	12,936,017
1928	1,046,937	134,089	.....	5,500	397,135	1,708,388	17,943,436
1929	1,189,125	199,402	.....	6,000	381,000	1,809,167	18,530,000
1930	1,662,445	218,907	.....	4,103	367,816	2,356,694	22,035,212
1931	649,234	112,050	.....	.....	303,551	1,445,405	12,972,467
1932	710,029	250,751	1,720	.....	296,853	1,541,703	10,117,784
1933	835,140	474,012	28,153	.....	270,407	1,881,018	12,481,008
1934	1,310,449	839,734	10,532	.....	258,330	2,890,855	15,359,653
1935	2,163,338	1,671,480	288,541	.....	290,610	5,074,809	23,762,332
1936	1,225,194	2,480,747	676,008	.....	215,642	5,136,702	16,178,001
1937	1,750,873	2,876,948	968,304	.....	309,782	6,416,811	23,376,056
1938	1,937,448	*3,574,137		19,968	176,551	6,116,061	25,059,025
1939	1,059,260	2,046,257	1,343,302	.....	217,020	5,089,152	16,327,772
1940	1,233,148	*3,279,686		4,634	270,706	5,176,647	25,460,290
1941	1,830,776†	*5,527,365		335,376	8,335,376	8,168,411	29,017,539

*1938 and 1940, Oregon and Washington combined.
†1941 includes Idaho.

processing other vegetables or fruits. Since the overhead is about the same whether one product or several are canned, the advantage of a long run on several products is obvious.

While a prospective location for growing canning peas is tested before a cannery is established, large-scale commercial production is not always profitable after the processing plant is in operation. For instance a large cannery at Montesano, in western Washington, was abandoned and the machinery removed in 1942 for use in a new cannery near the Blue Mountains. Part of the trouble in this case was difficulty in controlling aphid infestations that seriously decreased yields of peas near both Montesano and Longview.

The map (Figure 2) shows the concentration of pea canneries near the Blue Mountains in southeastern Washington and northeastern Oregon. These canneries include plants that are among the largest in the country. Some of the canneries in western Washington are small. Montana has three canneries and Idaho two which do not always operate on peas. In Utah there are 11 large canneries, and a dozen more small canneries, part of which operate only occasionally. As shown by the map of Utah (Figure 3) there are two main districts for canning peas. The most important of these extends from Salt Lake City to north of Ogden. The other district is in the vicinity of Provo.

The output of canned peas in the United States varies considerably. Thus in 1932, a low of 10 million cases was processed while in 1938 and 1940 the pack exceeded 25,000,000 cases each year. Up to 1933 only 5 to 10 per cent of the annual pea pack came from the West, with Utah the principal producing state in this area.

In Washington a few hundred cases were canned experimentally from 1919 to 1921 but the first real production was at Friday Harbor on the San Juan Island in Puget Sound in 1923. In 1924, Washington had 300 acres of

FIGURE 5.—Vining peas. The view shows the long slopes that descend from the Blue Mountains on which peas are planted. Fields on such slopes may differ in altitude by 3,000 feet or more which permits a harvest season of 45 days. Some farmers have as much as 1,800 acres of peas and the sequence of harvest on one farm may last a month. (Courtesy of Blue Mountain Canneries, Inc.)

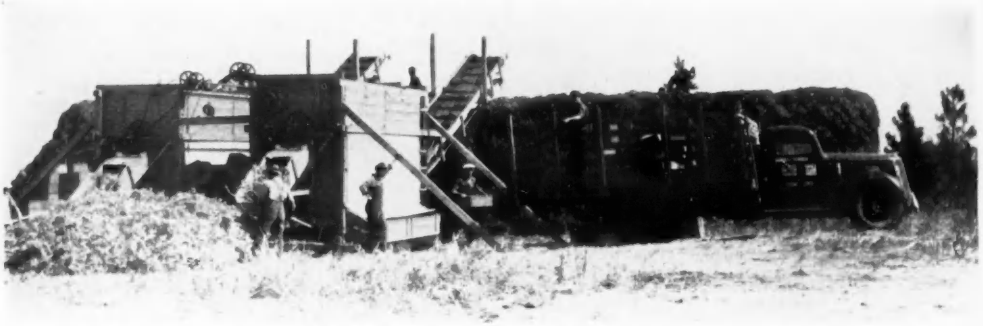


FIGURE 6.—Close-up view of pea viner. (Courtesy of Blue Mountain Canneries, Inc.)

canning peas supplying the one cannery at Friday Harbor. Other canneries began operations in western Washington and the pack increased to 474,000 cases in 1933. The pioneer eastern Washington plant was built at Dayton in 1934 and the pea pack of the state was practically doubled, reaching 840,000 cases. Other canneries were rapidly built in the Blue Mountain area in both Washington and Oregon until in 1942, ten canneries were operating here. These ten plants are large, modern affairs and accounted for one-eighth of the entire pea pack of the United States in 1938 and 1940, and one-fifth in 1939. The West as a whole now cans nearly one-fourth of all the peas in the country. Utah is close behind Washington and Oregon in production, and a steady production comes from Bozeman and Red Lodge, Montana. The California output is no longer of much importance and Idaho has processed peas only occasionally. See Table II. In addition to the United States pack, British Columbia canned 122,000 cases of peas in 1939. Some peas and carrots are canned together. Hot, dry weather cut production in 1940 in the Washington-Oregon area and a record planting of 80,000 acres to peas for the West yielded less than in 1937 and 1938 from a smaller acreage. See Tables III and IV. Of the western pack in 1940, amounting to 5,176,647 cases, Alaska, the leading variety elsewhere, accounted for only 86,173 cases of the total, and sweets made up the rest.

A good variety of pea for canning must be hardy, productive, of good

TABLE III

PEA ACREAGE

	Wash.	*Mont.-Wyo.*	*Oregon*	*Total West**	*Total U.S.A.*
1929.....	1,940	3,900	.....	20,910	232,920
1930.....	2,100	3,500	.....	22,370	266,740
1931.....	2,300	2,400	.....	15,400	223,350
1932.....	2,600	2,300	.....	14,170	187,800
1933.....	3,200	2,540	.....	17,370	217,430
1934.....	6,500	2,400	3,050	28,140	249,870
1935.....	15,000	2,800	8,180	49,800	315,040
1936.....	21,000	2,600	16,150	59,820	296,850
1937.....	26,000	2,430	21,200	72,220	334,820
1938.....	28,000	1,700	20,450	70,830	322,360
1939.....	21,500	1,600	19,100	55,450	252,430
1940.....	28,700	3,800	28,700	79,790	330,130
1941.....	27,500	4,000	22,000	72,820	364,850

*Includes Colorado and California.

TABLE IV

TONNAGE (SHELLED) PEAS

	Wash.	*Mont.-Wyo.*	*Oregon*	*Total West**	*Total U.S.A.*
1929.....	2,130	3,900	.....	22,210	203,810
1930.....	2,620	4,100	.....	28,060	244,470
1931.....	1,380	3,000	.....	14,310	147,470
1932.....	3,460	2,760	.....	15,000	116,730
1933.....	5,120	2,790	.....	18,940	136,980
1934.....	6,700	3,800	2,740	31,380	165,370
1935.....	15,000	3,200	7,160	57,430	268,100
1936.....	26,250	2,400	12,840	60,150	187,670
1937.....	28,200	3,030	15,480	72,220	268,110
1938.....	26,460	1,990	17,280	72,040	302,540
1939.....	23,000	1,860	18,340	60,460	198,110
1940.....	23,100	3,000	20,380	65,280	306,120
1941.....	34,510	3,800	37,180	95,600	347,930

*Includes California.

FIGURE 7.—Lugs used for transportation of peas. (Courtesy of Blue Mountain Canneries, Inc.)

quality, and with plants that develop uniformly. The pods should ripen all at one time since the peas are harvested with machinery, and the seeds should remain green after processing which gives the appearance demanded by purchasers. In the United States as a whole the Alaska, an early, smooth variety, furnishes the bulk of canning peas. However, in the northwest the "sweet" peas, that are wrinkled when dry, and mature somewhat slower than the Alaska, are canned almost exclusively. The Perfection and Surprise are the leading wrinkled peas used for canning. Peas like the Telephone, that have long vines and ripen through a long season cannot be used for canning, since machine methods of harvesting are available only for "one-crop" varieties that ripen uniformly.

Peas for canning should be resistant to wilt, blight, mildew, root rot, drought, and other diseases or weather handicaps. The chief insect pests are a pea aphid and the pea weevil. The Blue Mountain region is relatively free of diseases and pests. Only the pea weevil does any material damage here. Aphids are controlled best by crop rotations. Weevils may seriously reduce seed germination, unless the damaged seeds are sorted out. That is done by testing in a brine solution in which the light weevil damaged peas float away. On new ground for peas, the crop may be planted two or three years successively, but after that insect pests and fungus diseases are likely to reduce yields, and planting of peas on a given piece of ground is likely to be done only once in three to five years. Spraying for weevil control is practised by some growers. Hot weather is bad for the crop as the vines are stunted and yields reduced, besides which the crop may mature so rapidly that the peas cannot be harvested when at their optimum stage of development for the best quality of canned product. Peas are essentially a cool-weather plant. The crop requires cool temperatures for the best yield and highest quality. High temperatures ruin both yields and quality.

In planting peas on new ground for the first time the soil must be inoculated or a satisfactory crop will not be obtained. Various methods are used. Sometimes soil is taken from fields in which peas have been previously grown and is drilled into new areas along with the seed. More commonly the seed peas are treated with cultures of bacteria before planting. Seed is generally planted from three to four inches deep in rows with a drill at the rate of about four bushels to the acre. Peas are a "dry-land" crop in Washington, Oregon, and northern Idaho, and are irrigated either for canning or seed purposes except in the Snake River Plain of southern Idaho. The peas are seldom cultivated after planting.

Peas are planted as early as conditions of the soil permit in order that they may be harvested before the hottest, driest part of summer. Usually several plantings are made for convenience in harvesting. Later plantings mature more quickly than early plantings because growth is slow in cool weather. As peas approach maturity, they are watched carefully lest the crop pass

by its prime canning condition. Most often the peas are cut with an ordinary mowing machine fitted with special vine-lifting guards and a swather or windrowing device. Vines should be handled as little as possible after cutting, and only the quantity that can be quickly cared for should be cut at one time. While peas may be vined at the factory, usually portable field viners are used for shelling the harvested vines brought in from the fields. A viner costs close to $7,000 and is customarily furnished for use of the grower by the cannery. In hot weather, harvesting is done only in the cool part of the day. Peas must not be allowed to stand but should be canned as soon as possible to avoid development of "flat sour" or other deterioration by bacterial action. The canning of peas must be done quickly if a high quality product is to be prepared. The shelled peas in lugs are first carried by fast truck to the cannery. A truck may carry as many as 240 lug boxes each 14 by 26 by 10 inches. At the cannery the peas are weighed, graded as to quality, and cleaned. From the cleaner the peas go through the washer, after which they are graded in three sizes. Next, the peas are blanched and again washed. After inspection and immersion in brine which mechanically grades for quality, they pass into filling machines. Here cans are filled and tops are clinched on automatically. The cans of peas are then cooked in retorts and after cooling, they are ready for labeling and packing.

The pea crop for canning is grown under the contract system. The canning companies specify varieties grown and often furnish the required seed. The canners also generally assume general direction of the crop, determine the time for harvest as judged by maturity of the crop and need for peas by the cannery.

In some sections, both an early crop, generally the Alaska variety, and the wrinkled peas for a late crop are grown so that the length of the canning season is increased. Planting peas at different periods may also be used for a succession of crops. The slopes of the Blue Mountains afford ideal conditions since changes in elevation within short dis-

FIGURE 8.—Blue Mountain Canneries plant at Dayton, Washington.

FIGURE 9.—Interior view of pea cannery. (Courtesy of Vitart Studio.)

tances make natural climatic differences that permit production for canning of the same pea varieties over a period of several weeks thus making a long run for a cannery. Individual growers grow peas in fields that differ in altitude by 2,000 to 3,000 feet and can harvest peas for 45 days as a result of the climatic difference resulting from the great change in elevation on the long slopes that descend from the Blue Mountains. Some of the Blue Mountain canneries depend on a large output from a few producers rather than numerous small growers. Thus one cannery at Walla Walla secures almost all of its canning peas from six large-scale specialists in growing them.

In the Blue Mountain section peas are first planted in late March or early April, followed by other plantings at intervals of two weeks up to May 1. Harvest starts in late June and lasts 45 days.

The grower is paid on the basis of quality and size of the peas. Five sieve sizes are used, number 1 being smallest. The number 1 and 2 peas bring about $100.00 per ton, number 3 around $70.00, number 4 peas $40.00, and number 5 only $20.00 per ton. Since only 12 to 15 per cent of the peas grade out as number 1 or 2 the average price to the grower would be about $45.00 per ton. In 1942, canneries were offering contracts to growers at $2.50 above the fair prices established by the U. S. Department of Agriculture War Board. The usual yield of shelled peas is about one ton to the acre. In addition growers have from three to five tons of vines per acre available for livestock feed and fertilizer, that can be utilized to advantage by good management. In western Washington pea vine silage is used but it has only about one-third the food value of alfalfa hay. In eastern Washington the vines are dried and used for hay.

FROZEN PEAS

The freezing of peas is a new industry and the tendency is for it to increase in importance. Frozen peas are sold locally all winter in Washington and Oregon at prices slightly above the canned article. Distant markets can be reached only by shipment in a frozen condition and suitable refrigerators are not yet available in quantity for long shipment so that transportation becomes a limiting factor. Shipments should be kept at about 50 degrees F. and the pack is kept at zero to 10 degrees F. in the warehouses.

Statistics are not available for frozen peas for 1933 or earlier but in 1934, 1,756,000 pounds were processed in Washington. By 1940 this had increased ten times to 17,730,000 pounds. The frozen pack for the United States that year was 35,801,651 pounds, a record production, of which the state of Washington processed almost one half. A few peas are frozen in Utah and California also.

Five firms handle the bulk of the frozen pack. Two plants are at Snohomish, others at Kent, Monroe, and La Conner, all in western Washington. About 12,000 acres are devoted to raising peas for freezing. The processing

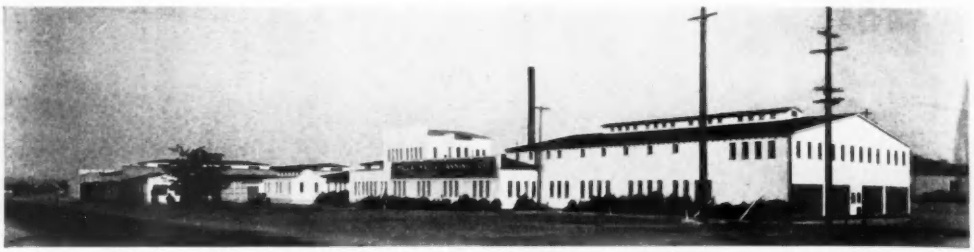


FIGURE 10.—Pea cannery at Walla Walla, Washington. (Courtesy of Vitart Studio.)

firms contract for crops at around $50.00 per ton for shelled peas. A freezing plant at Zillah, in the Yakima Valley of eastern Washington, also processed peas in 1942.

GREEN PEAS

According to the census, statistics for the 1939 green pea industry showed 2,397 farms in Idaho, Oregon, and Washington that raised the vegetable. There were 51,334 acres devoted to the crop which sold for $2,294,384. See Table V.

TABLE V

GREEN PEAS

	Farms	*Acres*	*Value*
Idaho	478	5,442	$384,141
Oregon	603	21,783	736,782
Washington	1,316	24,109	1,173,461
Totals	2,397	51,334	$2,294,384

Many of these peas were sold fresh in the cities and used in homes. Others were frozen and canned. Dry field and seed peas were not included in the table. Even without including the dry article the value of peas exceeded any other vegetable grown in the Pacific Northwest, exclusive of potatoes.

In 1942 the peas harvested in Whitman and Spokane counties, Washington, had a cash value to growers of approximately $15,000,000. The harvest in these two counties totaled 415,000,000 pounds which represents about 57 per cent of all dried and seed pea production in the whole United States in 1942. The farmers received four and one-quarter cents a pound for quality peas. The season was unusually favorable. The crop was almost free of weevils and very few peas became wrinkled or bleached by weather. The crop will require 4,000 railroad freight cars for shipment. The bulk of the peas are designated for overseas shipment under the lend-lease program. Split peas are exported for consumption and selected peas for seed. By agreement with the United States the British discontinued growing peas for seed in 1942 and instead used the land for the food crops in order to save space on ocean freighters.

Whitman County, Washington, has usually led all counties in the United States in output of wheat. But in 1942 the largest cash crop in Whitman County was dry and edible peas. About 300,000,000 pounds of peas worth $12,000,000 were harvested from 170,000 acres of land that yielded from 8 to 20 sacks per acre. By contrast the wheat harvest was 10,000,000 bushels from 290,000 acres.

SEMINOLE OIL FIELD CAMPS

John W. Morris

A TYPE of agglomeration peculiar to any petroleum producing area is the oil field camp. Many of the producing oil fields of the world, and particularly those of the Mid-Continent area, were discovered in regions of sparse to moderate settlement. In such areas, when oil is discovered, there is no place to house the incoming population. In the Greater Seminole Area, of east central Oklahoma (Figure 1), towns and cities had not developed where the discovery wells were drilled. In 1920 Seminole, Earlsboro, Maud, and Konawa were small villages of less than 1,000 population. Wewoka, the largest village in the producing area, had a population of only 1,520. Since these villages were serving only as small trade centers for the farmers of the area, they did not increase in size a great deal, if at all, between 1920 and July 1, 1926. Between July 1, 1926 and January 1, 1927, four of the world's largest producing oil fields, Seminole City, Bowlegs, Earlsboro, and Searight, were discovered. All were centered in the area about Seminole and Earlsboro. With the discovery of oil came thousands of people seeking work. The housing facilities of the villages within the area were taxed beyond capacity. The roustabouts, drillers, and roughnecks were mostly single men who needed only rooms in which to live, but the permanent employees, such as pumpers, pipeline walkers, and gang bosses, were married men who desired to bring their families with them. Since the villages could not supply homes for these families, it was necessary for the oil companies to do so.

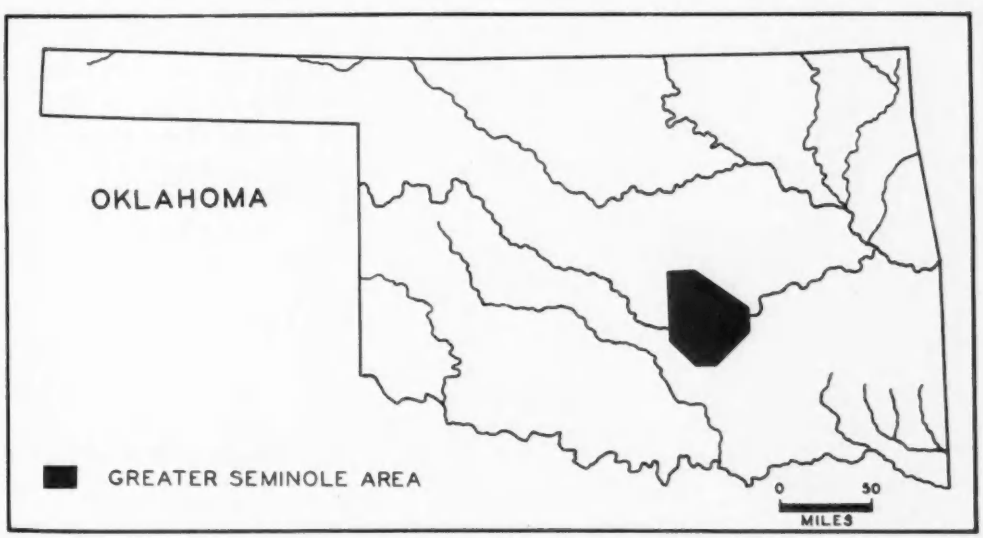


FIGURE 1.—The Greater Seminole Area is one of the principal oil producing regions of Oklahoma. Covering an area of some 1,200 square miles it contains seven of the nation's most important producing pools: Bowlegs, St. Louis, Seminole, Searight, Earlsboro, Little River, and Allen. Numerous smaller pools also dot the area. Prior to January 1, 1940, this area had produced more than 1,000,000,000 barrels of oil.

FIGURE 2.—Highway frontage camps are the most common type of camp in the Greater Seminole Area. Neat, home-like, company-owned, they are a direct contrast to the rather drab landscape of tank farms, oil wells, and abandoned land.

LOCATION

The oil field camps of the Greater Seminole Area are agglomerations of houses. The smallest camp in the area, located northwest of Bebee, has four homes. The largest camp adjoins the city of Seminole on the east, having 166 homes. None of the camps has in it any type of retail or personal service establishments such as grocery and drug stores or barber shops. They are residential, office, and warehouse groupings only. The camps are located as close as possible to the producing unit they serve. The camp that houses the employees of Cracking Plant No. 12, southeast of Seminole, adjoins this plant area on the east; the workers at the pipe-line pump station west of New Lima live in homes on the same ground as the station. The workers in the producing fields live in camps as near their place of work as safety permits.

When the camps were built, no consideration was given as to their location relative to towns and cities. Because the roads of the area at the time were so poor that travel to and from work was a distinct factor in location, the first consideration was to get the employee as near his work as possible. After the camp was located and construction begun, connecting roads to the main highways were soon improved.

SITE

No big business in the United States realizes the necessity of safety and health any more than do the large oil companies. The selection of a camp site is always an important matter. The source and condition of the water supply are among the first items checked. The camp site selected is usually one that is suitable to planning. When there are large native trees in the area, they will be utilized for shade purposes if possible. The company still attempts to clear the stagnant pools and swamp areas if any should exist in the vicinity. When camps are located near swamps too large for drainage, as in the area near Seminole, oil is poured over the water to prevent mosquito breeding. The average site is planned for ten to fifteen houses.

TYPES OF CAMPS

Oil field camps, like cities and homes, have individualities. The numerous camps within the Greater Seminole Area can generally be classed, however, under one of four headings, according to the arrangement of the houses: highway frontage, double frontage, hillside, and non-company. There are a few camps, of course, that do not fit into any of these classifications.

Highway Frontage. The most common arrangement for the smaller camps is to have the houses facing the highway or road. The houses are spaced about fifty feet apart and are in line, the front steps and porch of each being the same distance from the road. The Mi-Jo Camp (Figure 2), north of Bebee, is representative of this group. Wire fences are usually built in front of the camp along the right-of-way. The fence posts and rails are made of used iron

pipes or tubing. Cement sidewalks are often built from the front steps to the gates. Flowers, as well as evergreens, are sometimes planted in front of the house, and lawns are neat and well kept.

At the back of the camps are two- and three-car garages. No driveways go between the houses, but all cars enter from the side of the camp. The roads to the garages are usually graveled. The back yards of the camps are just as clean and neat as the front yards. They are usually covered with grass, and occasionally there is a garden spot. Clotheslines of wire or rope are often put up between the garages.

Regardless of the size of the camp, electricity, natural gas, water, and telephones are nearly always available. Natural gas for fuel is piped to each house from the near-by field. The company drills deep wells for the water supply and usually has its own standpipe and sewage disposal plant. Since an office building is always located in each camp, telephone service from the nearest village or town is available.

Hillside Camps. Due to the hilliness of the Greater Seminole Area, it was impossible for some camps to be located on level ground. In such cases the camps have been constructed on the hillsides in more or less stair-step or terrace fashion. The camp located at Plant 12, southeast of Seminole, is one of this type. Plant 12 has three rows or terraces of homes. A graveled road runs down the hill in a U-shape, thus going between each of the rows of houses. Concrete or rock retaining walls have been built along the roadside. On the highest terrace, one looks down upon the roofs of the other houses from one's own front door. The slope of the last two terraces being more gentle, the fronts of the houses are built facing each other. Garages are constructed at the ends of the first and second terraces.

FIGURE 3.—The double-frontage camps have, on the average, more homes in them than any of the other types; none has less than sixteen homes and one has 166. Due to the large number of families various types of playgrounds have been established. Often these camps have their own elementary school.

The homes at Plant 12 are not all the same size or shape. This is true of all the larger camps. The houses are arranged in an orderly fashion, surrounded by well-kept lawns. As was true of the previous group of camps, concrete sidewalks and steps have been laid. All of the homes, too, are equipped with electricity, running water, and natural gas.

Double Frontage Camps. Many of the larger camps are built so that the houses are in rows facing each other (Figure 3). Such camps are often

built at right angles to the highway; however, no road extends from the highway between the front of the houses. The common front yard is covered with grass. Down the center of this yard is usually a broad cement sidewalk with narrow sidewalks extending at right angles from the large one to each home. The houses and other buildings in this camp, as in the other camps previously described, are painted and in good repair. The most common colors are white or very light gray. Roofs are either green or unpainted.

In order to make camp life more attractive, some recreational facilities have been added. Tennis courts are available in some. Croquet grounds equipped for night-lighting are found in many of the larger camps. Horseshoe pitching grounds are common.

Non-Company Camps. The poorest type of camp, the camp in the worst condition, is the non-company camp (Figure 4). It is in direct contrast with the company-owned camps in that it has no planning. The grounds are poorly kept, the houses are usually in a run-down condition, and the roads are not graveled. In the oil industry, as in any big business, there is a group of workers that can be classed as part-time employees. It is to aid this group that the companies permit camps of this type. These camps are constructed on land owned by the company and set aside for this purpose. The employee builds his own house. The company charges him nothing for the use of the land and will furnish him electricity, water, and natural gas free of charge, if he will connect them to his house. The builder can usually sell his house for almost the original cost when he gets ready to move. Since the company does not specify the shape or size of the house, nor the kind of material of which it is to be constructed, a camp of this kind resembles an architectural nightmare. The company does reserve the right of spacing. Some of the residents take pride in their homes, set out flowers and grass, paint the buildings and keep them in good repair, but the great majority live in the houses as they are and never try to make any improvements.

HOUSE TYPES

Oil field camps are temporary agglomerations. Since the company builds homes to meet an emergency, the houses

FIGURE 4.—The non-company camp clearly shows lack of planning. Serving as homes for part-time laborers and a transient population, the camps contrast vividly with the landscaped company-owned camps. Poorly constructed houses, weedy yards, and unsanitary conditions are often common.

FIGURE 5.—The shotgun house is characteristic not only of certain types of oil field camps, but of oil field homes in general. Cheap, easy to build, and compact, they serve as the temporary quarters of the lower paid oil field group. Box windows, overlapping boards, and the latch of a front porch are their distinguishing marks. The camp shown here has been abandoned.

must be types that are easily put together and just as easy to tear down and move. If it is necessary to build a large camp at the beginning, houses will be moved later, one at a time, if needed elsewhere, as production becomes steady and the number of workers decrease. One afternoon while the writer was mapping the Shell Camp east of Earlsboro, a sudden thundershower caused the completion of the work to be postponed. On returning two weeks later to finish the map, the writer found that all buildings, fifteen houses, eight garages, and three tool sheds, had been moved to another location in New Mexico. The foundations on which these buildings had been placed were moved also.

Ready-made Houses. The most common type of company house is the ready-made house. It has five, seven, or nine sections to a side and two sections to each end. These sections and the room partitions are made so that they can be fastened together according to a specified plan. On the outside a vertical board shows where these sections have been united. The houses range in size from four to eight rooms with bath and storage space. The ready-made houses are always two rooms in width. A porch is boarded up half way and screened the rest. The houses are finished inside with sheetrock or beaver board, and papered. They are generally set on concrete blocks or some other substantial foundation. The roofs are covered with wood shingles.

Shotgun Houses. The second most common type of house is classified as the shotgun (Figure 5). These houses are built with one room directly behind the other, thus they are never more than one room in width. The number of rooms to the house is generally two or three, although some of them have four. There is very seldom a front porch but generally a screened-in porch is added to the back of the building. The larger shotgun houses are usually modern in all respects. The houses are constructed of boards nailed vertically with another board nailed over the crack between each two boards. The windows are box-like affairs with the box extending two or three inches out from the outside wall. Screen wire is nailed over the outside of the box in

place of the regular sort of screens. The houses are set on good foundations, painted and kept in repair.

A variation of the shotgun house is found in some of the camps. These houses are constructed in the same fashion as the shotgun except that they are two rooms in width. Some also add a screened-in porch to the front of the house. These porches are often used for sleeping quarters. Many of the front porches are made into summer living rooms. The roof of the shotgun, as well as the roof of this variation, has the shape of a broad inverted "V" and is shingle covered.

A second variation of the shotgun house is built in the non-company camps. It is constructed in the same manner with the exception of the roof. Instead of the roofs being pointed, they are circular in shape, being rounded just enough to cause the water to run off (Figure 6). This type of roof is made of thin boards that will bend. After being nailed in place the roof is covered with tar paper to prevent leaks. This type is not so high as the regular shotgun, the ceiling of the rooms being about a foot above the door top.

Permanent Homes. Occasionally a few permanent homes are built in the larger camps. These homes are generally bungalows of seven or eight rooms. The houses are on concrete foundations, painted white, and kept in good repair. They are designed and built with the idea that they will never be moved by the company, but will be sold for as much as possible when the company is through with them. Generally they are sold to people in the near-by villages or towns who have them moved to town for use (Figure 7).

FIGURE 6.—The curved roof shotgun house is a cheaper building to construct than that shown in Figure 5. It is usually found in the non-company camps. Built during the "boom" period, these unpainted houses have been in almost constant use.

ADVANTAGES

Typical camp life is pleasant. The people in any one camp all work for the same company, although many various types of work may be represented among the inhabitants. The camp population is small enough to permit all to be neighbors, yet restricted enough to give each family its own privacy. Oil people are moved frequently, so it is not at all uncommon when one moves to a new camp to find an acquaintance from Illinois, Texas, or New Mexico living next door. No camp in the Area has any special type

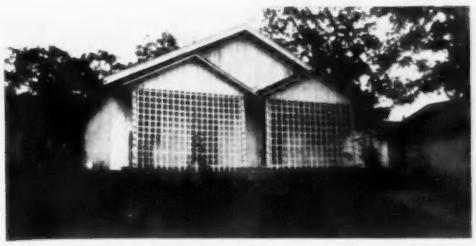


FIGURE 7.—In order to meet demands for larger houses, two shotgun houses are often made into a single structure. The two small houses are placed side by side, a common roof put over both, doors cut in the former outside walls to make openings between the rooms, and a porch added.

of government, but each company has specific rules for emergencies, such as fire. In large camps where there are many children, the local school districts often furnish a teacher, or teachers, and the company the school building for the grade school children. High-school students are transported to the nearest high school.

Living in a camp is a distinct saving to the workers. Rent is charged for the use of houses at so much per room. The average rate is $2.00 per room, per month, although it is not uncommon to find the best houses renting for $1.00 per room, per month. In addition to the low renting costs, natural gas for fuel, running water, and electricity are usually furnished free of charge.

CULTURAL FAULT LINE IN THE CHEROKEE COUNTRY

Leslie Hewes

THE Oklahoma Ozarks have long been the home of the majority of the Cherokee Indians. Indian land continues to present difficult problems in the area.

This article is concerned with a comparison of some significant cultural features of the eastern, generally speaking the wooded, or Ozarkian, portion of the Cherokee nation, which is conveniently bounded by the Grand, or Neosho, and Arkansas rivers on the west and south, with the cultural features of the bordering portion of the Arkansas and Missouri Ozarks. Such a comparison should indicate the importance or unimportance of Indian occupance as a theme in the cultural geography of the Oklahoma, or Cherokee, Ozarks.

Comparison of Cherokee Ozarks and Bordering Ozark Counties

The eastern border of the Cherokee country is a cultural boundary which has much the nature of a "cultural fault line." In a number of respects the country to the west, in the Cherokee Ozarks, lags behind the country immediately to the east: population is less dense, rural land use is more primitive, farm buildings are poorer and not so well kept, towns are fewer and smaller, and trade is not so well developed.

The Cherokee Ozarks region is a little larger in area than the three Arkansas counties and one Missouri county bordering it (Figure 3). Its population is somewhat less, 93,425 in 1940 as compared with 116,931 in the bordering counties. There is near equality in amount of crop land, on the percentage basis 24.0 and 27.1, respectively, according to the 1930 census. However, there is less than one-half as much fenced pasture on the Cherokee side (13.1 per cent and 29.5 per cent, respectively). Unimproved land may be estimated at 60 per cent in the Cherokee Ozarks; at 40 per cent in the border counties.

The Cherokee Ozarks lag more in quality of use than in the amount of land used for agricultural purposes. The region is more devoted to corn; has less land in orchards, vineyards, and small fruits, and in hay. The contrast in fruit production is especially pronounced. Except for a few localities, orchards and vineyards, which are so common in the border counties, are not common in the Cherokee Ozarks, amounting in 1930 to only 2 per cent of the crop land as compared with a 10.3 per cent average for the border counties.

Farm buildings in the Cherokee Ozarks are of poorer construction than those immediately to the east. A compilation of house counts made along both sides of 94 miles of highway and byway in the Cherokee Ozarks showed the following totals: frame with vertical siding 197, clapboarded frame 191, log 68, stone 15, brick 3, others 22, aggregate 496. Thus, primitive frame houses with vertical siding and log houses amounted to over one-half the total. In contrast, the totals for 47 miles in Benton and Washington counties, Arkansas, were: clapboarded frame 191, frame with vertical siding 24, stone, brick, or stucco 7, log 3, others 2, aggregate 227. Frame houses with vertical

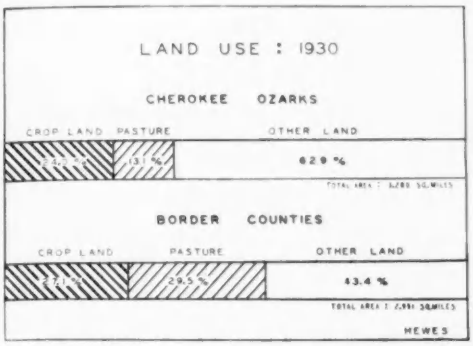


FIGURE 1.—Land use on the two sides of the eastern border of the Cherokee country compared. Free use of the woodland range in the Cherokee Ozarks has retarded fencing for pasture.

siding and log houses amounted to less than one-eighth the total.

Most of the houses of the Cherokee Ozarks are small and unpretentious, and often are in poor repair. A sampling in the Springfield Structural Plain section along both sides of 48 miles of road and in two representative areas of four square miles each showed only 20 houses in a total of 283 to be over one story high; only 76 were painted. For traverses totaling about 30 miles in Benton and Washington counties, comparable figures were: total number of houses 171, of more than one story 50, painted 104, with about one-half the remainder showing evidence of earlier painting. Both 1930 and 1940 census data support the generalization that farm buildings in the Cherokee country are poorer than in the border counties.

The Cherokee Ozarks are almost entirely rural. The only town to meet the census definition of urban is Tahlequah, whose population exceeded the required 2,500 in the censuses of 1910 and 1940. In 1940, the population of incorporated towns totaled only 17,248, or 18.5 per cent of the regional total. The four border counties had five urban places, and 38,144 inhabitants in incorporated towns, or 32.6 per cent of the total.

The per capita retail trade in the Cherokee Ozarks is only about one-half as great as that of the four bordering counties, averaging $100.00 per capita in the four chief counties of the Cherokee Ozarks and $227.00 in the four counties immediately to the east.

CULTURAL EXPLANATION OF RETARDATION OF CHEROKEE OZARKS

The explanation of the retardation of the Cherokee Ozarks lies in culture history, rather than in deficient natural equipment, since rocks, landforms, soils, hydrography, natural vegetation, and climate appear much the same as immediately to the east.

A basic part of the explanation of retardation of the Cherokee Ozarks is the considerable survival of pioneer conditions. It is claimed that in earlier years Cherokee settlement and white settlement in adjacent portions of the Ozarks were not to be distinguished (Grant Foreman, *A Traveler in Indian Territory, The Journal of Ethan Allen Hitchcock*, Cedar Rapids, Iowa, Torch Press, 1930, p. 245), but Cherokee occupance, especially Cherokee control of immigration, later prevented as rapid increase in population in the Cherokee area as to the east. In 1880,

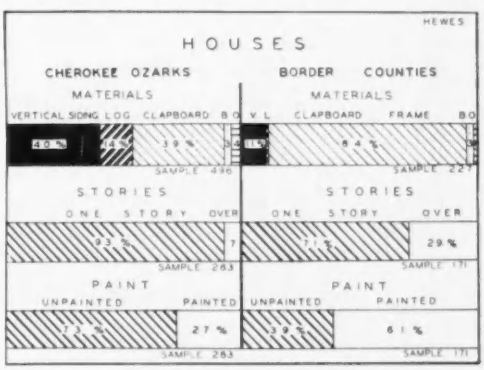


FIGURE 2.—Comparison of houses in the Cherokee Ozarks and in the counties bordering on the east. (B stands for brick, stone, and stucco; O for "other." In each graph, except for "other" houses, quality improves to the right.)

the average population density of the Cherokee Ozarks was about six per square mile as compared with 22.6 in the four border counties (*Summary of the Census of the Cherokee Nation*, 1880, and *Tenth Census of the United States*, 1880, respectively), a density not reached in the Cherokee Ozarks until 1910, or after the ending of Cherokee government. In the Cherokee Ozarks, 2.4 per cent of the land was in cultivation in 1880; 16.8 per cent was the average in the border counties. Corn, the several-purpose crop of the frontier, occupied 10.7 acres of the 16.4 acres of crop land on the farm of the average Cherokee citizen in the Cherokee Ozarks. The animal industries were almost entirely open-range industries, and the log house was the usual type. Although the inter-regional contrasts in settlement are, on the whole, less sharp now than in 1880, especially in respect to population density and amount of crop land, both of which may now be in proportion to land resources, a number of pioneer traits are better preserved in the Cherokee Ozarks than immediately to the east. Among these are continued general dependence on corn and open range, and much use of spring water and of log cabins.

It appears that the people of the Cherokee Ozarks have not been as responsive to culture-modifying stimuli as have their neighbors. Many Indians of the area, especially "full-bloods," are very conservative and very poor, and in many cases resent the destruction of game, the allotment of land, and the presence of the white man. A very large number raise no crops other than corn and a few garden vegetables, drink spring water, and live in log houses. Another larger non-progressive group consists of poor whites, commonly renters, who came to the region during the period of Cherokee government as

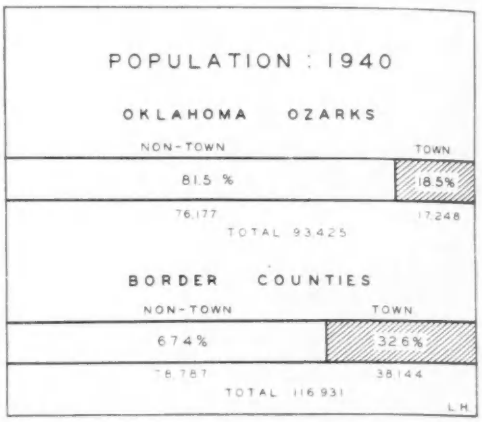


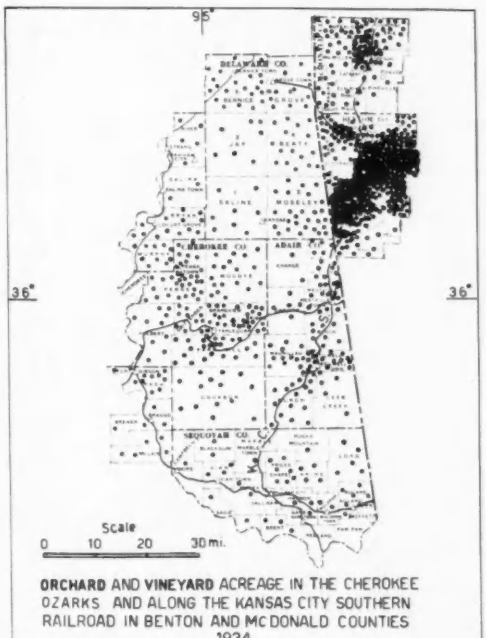
FIGURE 3.—Towns are larger and more numerous east of the Cherokee Ozarks than in them. Town population is the total of all incorporated towns.

laborers or renters on Indian land, or as illegal intruders, or to rent some of the newly alloted land immediately after the breakdown of Cherokee government. After the white renter population, the main white element, had grown large in the Indian Territory, a lifetime resident reported, "As a general rule, they are the unfortunate class known as the 'poor whites' of the South" (Alice M. Robertson in *Twenty-fourth Annual Report of Board of Indian Commissioners to Secretary of Interior*, 1892) and, "as there are no schools open to children of these renters, the Indians refusing to allow them to attend their schools, the best class of laboring whites will not live in the Territory." It might be added that this group was in the Indian Territory only on the sufferance of the Indians; the whites had no political rights, and no immediate prospect to be other than laborers or renters on Indian land.

A large amount of farm tenancy in the Cherokee Ozarks is a handicap to improvement. In 1930, over one-half of all farmers in the Cherokee Ozarks were tenants as compared with less than one-third in the border counties. In 1940, the inter-regional difference

was less but was still considerable. On both sides of the boundary, tenancy increases to the south. The planting of orchards and vineyards, the development of dairying and other care-requiring phases of the animal industries, and the keeping-up of farm buildings are not generally to be expected on the tenant-operated farms of the region. The long-time institution of white tenancy is encouraged by the large amount of poorly used Indian-owned land which can be rented at minimum prices.

According to the Cherokee census of 1880, fruit raising was relatively more important then than now. In 1879, 2,243 acres were reported as in fruit trees, or 5.9 per cent of the cultivated land of the six easterly districts of the Cherokee nation; in 1930, there were 8,218 acres of orchards, vineyards, and planted nut trees, amounting to 2.0 per cent of the crop land. Thus, the orchard acreage has increased since 1880 but not so rapidly as that of other crops, and notably less rapidly than the fruit acreage immediately to the east. It should be noted that between 1930 and 1940 the fruit acreage in the counties bordering the Cherokee country on the east declined, but it still remains much in excess of that of the Cherokee Ozarks.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ORCHARD AND VINEYARD ACREAGE IN THE CHEROKEE OZARKS AND ALONG THE KANSAS CITY SOUTHERN RAILROAD IN BENTON AND MC DONALD COUNTIES
1934
• 20 ACRES
RAILROAD
NOTE: A SMALL ACREAGE IN PLANTED NUT TREES IS INCLUDED EXCEPT IN BENTON COUNTY, ARKANSAS
L.H.

FIGURE 4.—Orchard and vineyard acreage in the Cherokee Ozarks and along the Kansas City Southern Railroad in Benton and McDonald counties. The barrier quality of the eastern boundary of the Cherokee country is immediately evident along the K.C.S. Data are by townships.

Accessibility to transportation facilities has had an important part in localizing fruit production. As summarized by Marbut, the coming of railroads encouraged the planting of orchards in the 1880's and 1890's in the western part of the Springfield Plain in Arkansas and Missouri and in a narrow belt along the St. Louis and San Francisco railroad southward into the Boston Mountains (Curtis F. Marbut, "Soil Reconnaissance of the Ozark Region of Missouri and Arkansas," *Thirteenth Report, Field Operation of the Bureau of Soils*, 1911). The bordering counties were served by a rail outlet to the north some years before the Cherokee Ozarks had one. The short lag in rail development doubtless held back the fruit industry in the Cherokee Ozarks. However, in the country served by the Kansas City Southern in Arkansas and Missouri, north of Siloam Springs, both orchards and vineyards are more common than they are in the Cherokee Ozarks south of Siloam Springs along the same railroad. Figure 1 shows the orchard and vineyard acreage for 1934 by minor civil divisions. Obviously more than the date of the establishment of rail service is involved. The Cherokee boundary, west of which land was owned in common until allotment, which took place in the period 1903–1910, and could not be bought by white men, effectively

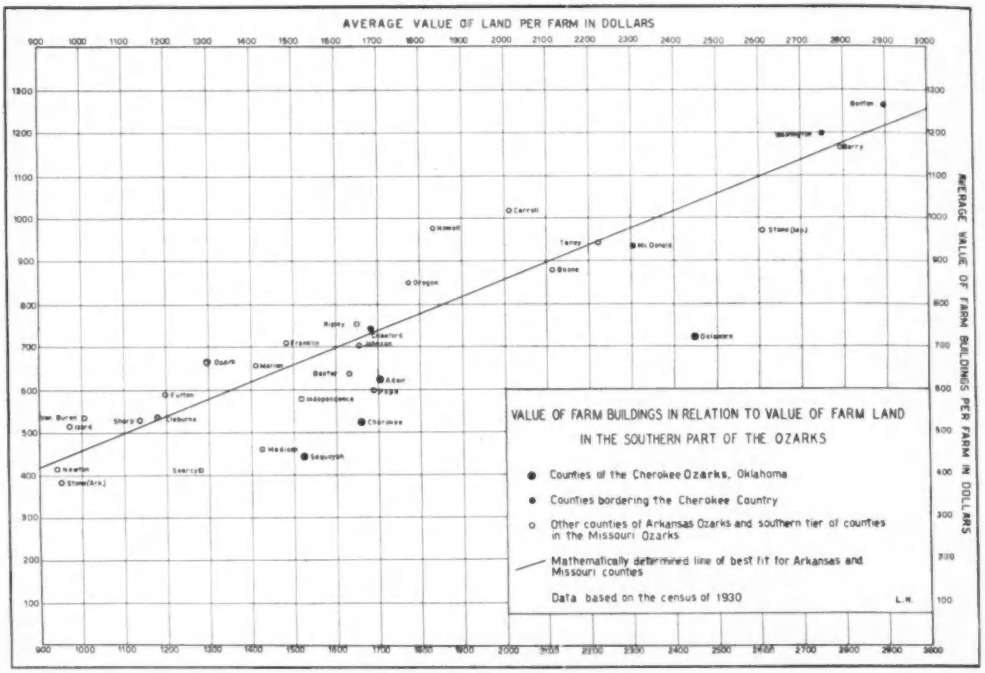

AVERAGE VALUE OF LAND PER FARM IN DOLLARS
AVERAGE VALUE OF FARM BUILDINGS PER FARM IN DOLLARS
VALUE OF FARM BUILDINGS IN RELATION TO VALUE OF FARM LAND
IN THE SOUTHERN PART OF THE OZARKS
Counties of the Cherokee Ozarks, Oklahoma
Counties bordering the Cherokee Country
Other counties of Arkansas Ozarks and southern tier of counties in the Missouri Ozarks
Mathematically determined line of best fit for Arkansas and Missouri counties
Data based on the census of 1930
L.H.

FIGURE 5.—Value of farm buildings in relation of value of farm land in the southern part of the Ozarks. The buildings in the Cherokee country are poor in comparison with the regional standard. The poorness of buildings is not entirely the fault of poor land. The mathematically fitted line is the regression line of y on x.

kept out new fruit growers, and most of the inhabitants of the area were unresponsive to the development taking place to their east.

The poorness and primitive character of farm buildings in the Cherokee Ozarks may be the result of the survival of pioneer house types, and, incidentally, of pioneer attitudes. Figure 2 is a graphic representation of the correlation of the average value of land per farm and of farm buildings per farm, based on 1930 census data, in those Missouri and Arkansas counties which lie in the Ozarks to the east, and the failure of the farm buildings in the Cherokee counties to come up to the line of best fit. In both value of farm buildings and of dwellings per farm the best of the Cherokee counties was poorer than the poorest of the four border counties, although it had more valuable farm land than two of the four border counties. The poorness of farm buildings in the Cherokee Ozarks cannot be accounted for entirely on the basis of poor land.

The small number and size of towns in the Cherokee Ozarks is an outgrowth of past conditions. The first town established was Tahlequah, in 1839. Fort Gibson followed in 1857. There were no others until the period of railroad building in the 1880's and 1890's. The meagre town development was due in part to scanty population and long-continued pioneer economy, and in part to dependence on a line of trade centers just across the eastern boundary of the Cherokee nation, where merchants were free to carry on their trade without federal or Cherokee permit and where the liquor business was legal. Van Buren was early the chief trade center for the Cherokee Ozarks; later Fort Smith displaced it.

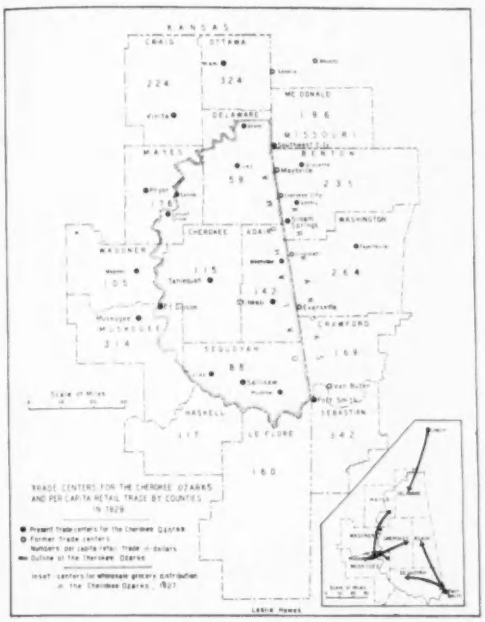


FIGURE 6.—Trade in the Cherokee Ozarks in relation to bordering areas. Low per capita trade in the Cherokee Ozarks is in part the consequence of dependence on trade centers just over the eastern border. Trade also goes west and north from the Cherokee Ozarks. (Source of statistics: Retail trade, *Fifteenth Census* wholesale grocery distribution from J. W. Millard, "Atlas of Wholesale Grocery Territories," *Domestic Commerce Series*, No. 7, 1927, plate 9.)

The small amount of trade carried on in the Cherokee Ozarks is due both to limited income and to continued dependence on outside trade centers—to the east, and now to the north and west. Figure 3 shows per capita retail trade by counties and indicates the main centers where the trade of the Cherokee Ozarks is carried on. The per capita retail trade is less than the income would support. Statistics showing total income are not available, but since both the Cherokee Ozarks and the border counties are primarily agricultural, a valid comparison may be made using farm income (not counting the value of products consumed on the farm). For the four main counties of the Cherokee Ozarks, as determined from the 1930 census, the average income per farm was 5.7 times the amount of the per capita retail sales, whereas the average farm income in the four counties immediately to the east was only 3.2 times as much as the average per capita retail sales. (See Table I.)

TABLE I

AVERAGE INCOME PER FARM NOT INCLUDING VALUE OF PRODUCTS CONSUMED ON THE FARM COMPARED WITH AVERAGE PER CAPITA RETAIL SALES

COUNTIES OF CHEROKEE OZARKS

	Delaware	*Sequoyah*	*Adair*	*Cherokee*	*Average*
Income per farm[1]	$717	$556	$543	$447	$568
Per capita sales, dollars[2]	59	88	142	115	100
Ratio of income per farm to per capita sales[3]	12.2	6.3	3.8	3.9	5.7

BORDERING OZARK COUNTIES

	Washington	*McDonald*	*Benton*	*Crawford*	*Average*
Income per farm[1]	$772	$717	$697	$660	$725
Per capita sales, dollars[2]	264	196	235	169	227
Ratio as above[3]	2.9	3.7	3.0	3.9	3.2

[1] Computed from Fifteenth Census: 1930, Agriculture III, pt. 1, p. 773, and pt. 2, pp. 792–801, 904–912.
[2] Computed from Fifteenth Census: 1930, Distribution I, Retail Distribution, pt. 1, pp. 242–255, 580 f., 724–751.
[3] Per capita sales were assigned the value of 1.

The towns to the east continue to divert trade from the Cherokee country, thus reducing the growth of towns. (A conclusion which is also arrived at by William T. Chambers in "Shopping Areas of the Near Southwest," ECONOMIC GEOGRAPHY, Vol. 17, No. 2, April, 1941.)

Former Indian and white settlement areas in the western Ozarks continue to differ. The eastern border of the Cherokee country is a cultural fault line due largely to the unlike culture histories of the lands on its two sides. Thus, Indian occupance is a significant theme in the cultural geography of the Cherokee Ozarks. Indian occupance may well have similar importance in other portions of the Indian Territory.

WHITE BLUFF: A COMMUNITY OF COMMUTERS

Helen L. Smith

THE problem of the small town in our country is worthy of serious study, for the typical American village, ranging from 250 to 2,500 in population, is a somewhat unique phenomenon. It has a morphology, a function, and a social significance quite unlike agglomerations found elsewhere in the world. These villages are the homes of nearly one-sixth of our population, and many of them will, no doubt, maintain their positions as the economic capitals of rural areas. But these small communities have undergone many changes during the past few decades which have, in turn, given rise to a number of problems. Can such towns continue to grow in the face of economic factors which are responsible for the present flow of population from agricultural pursuits in rural areas to metropolitan areas? Can villages that have lost their commercial function owing to modern transportation developments maintain normal growth without major industrial interests? What changes in their social and recreational life accompany such trends? Will the development of suburbanization change the structure of our American villages? With the trend toward decentralization some persons feel that probably villages already constitute the most rapidly growing part of the nation.

The purpose of this study is to show the various functional changes in a small Tennessee town in so far as they are illustrative of the problems of some of the small agglomerations of our country.

Early Occupance

White Bluff, a village of 522 persons, is located on the edge of the Highland Rim and some 30 miles west of Nashville (Figure 1). Even though it was established as a town much later than most settlements of middle Tennessee, its growth can be divided into several periods according to the services rendered by the village.

FIGURE 1.—Location of the White Bluff community (black) in Dickson County (cross-hatched), Tennessee.

The first stage was preceded by a long period of settlement in the immediate vicinity. Settlers came to this region (Dickson County) as early as 1786 when large tracts of land were being granted by the state of North Carolina for services rendered during the Revolutionary War. During this pioneer period there was but one major industry in the region—the manufacture of iron. The iron banks from which the ore was obtained are numerous and

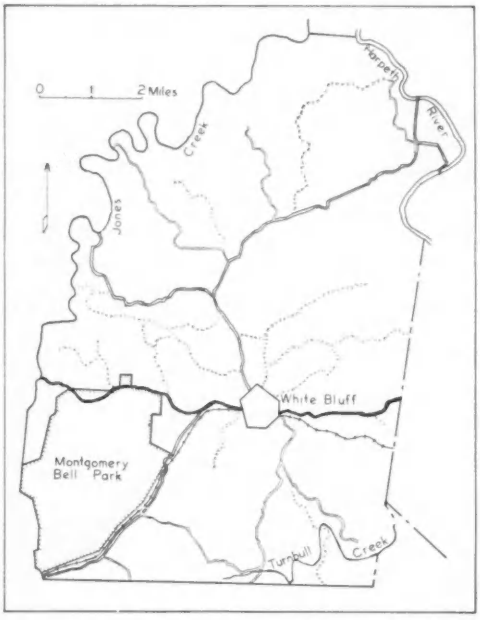


FIGURE 2.—Rural hinterland of White Bluff, showing transportation facilities.

rich here on the Highland Rim. The earliest furnace west of the Alleghany Plateau was the Cumberland Furnace built in the north central part of Dickson County in February, 1793. At one time there were eight or ten furnaces in the county. In iron production, Dickson County ranked second in Tennessee.

There was also an abundance of hardwood forest for the making of charcoal used in smelting the ore. It was estimated that each furnace used 500 acres of timber annually. The capacity of the average furnace was 12 tons of pig metal per day.

From the furnace the iron pigs were usually hauled in wagons to the forge. These forges were always built near a source of water power because much water was needed to operate the trip hammer. One of these forges was located about three miles southeast of the present site of White Bluff on the Turnbull Creek (Figure 2). Here the creek had cut into the limestone bed rock leaving a bluff 200 feet high and because of this the forge was called the White Bluff Forge. Later, when the town was started, the name was transferred. The site of the Laurel Furnace which supplied most of the pig iron for the White Bluff Forge and which operated until the Civil War, is in the new Montgomery Bell Park which is being completed just west of White Bluff (Figure 2). It is quite evident, then, that supplies of iron ore and water power attracted the first settlers.

FOUNDING AND GROWTH

The founding of the town of White Bluff and the beginning of the first period in the settlement of this village dates from the building of the railroad across Dickson County during the War between the States. Prior to the war the Nashville and Northwestern Railroad was built as far as Kingston Springs, a small town about six miles east of White Bluff. A route had been surveyed up the Turnbull Creek to the White Bluff Forge, but the road never got there because, in 1862, the Federal soldiers gained control of this region and laid out the road according to the most direct route to the Tennessee River. This avoided the area where the forge was located. The road was completed as far as the Tennessee River and used before the close of the war. One of the Federal work camps was located on the widest ridge area overlooking the undulating plateau—the present site of White Bluff. After the war, people drifted in and built homes as soon as the soldiers left and the name White Bluff was selected. A general store was opened that same year. The town was laid out in 1867 and incorporated two years later.

In 1886, White Bluff was described as a flourishing town of about 300 inhabitants with three blacksmith and

wagon shops and a planing mill recently established. Population figures show no marked booms and no declines in its growth. Yet since 1865, the town has served in various roles.

The chief functions which contributed to the development of White Bluff have been (1) an industrial function based on the presence of very fine timber in the hinterland, (2) a commercial function supported by a small amount of excellent farm land in the Harpeth River Valley, (3) a recreational function serving the summer colony fed from Nashville, and (4) a residential function due chiefly to the development of rail and highway transportation to metropolitan areas. These changes which have fostered the gradual but yet steady population growth of White Bluff have been definitely related to its umland and to Nashville, 30 miles distant.

LUMBERING INDUSTRY

The lumbering era of the community began in 1862 with the building of the railway. There was always local demand at Nashville (as well as at more distant places) for the oak, poplar, ash, hickory, and walnut which grew here. The principal uses were for barrel staves, saw logs, and railroad ties. In the early days great piles of this lumber could be seen near the railway station ready for shipment.

The building of the railroad was also promptly followed by promoting companies which advertised in glowing terms in order to attract settlers to these parts. It would be hard to estimate the amount of immigration due to such postwar boom. No doubt, these combined factors—presence of much merchantable timber, railway and highway transportation facilities to Nashville, and publicity—were the most constant in the early growth of the town.

At the present time, White Bluff still has eight sawmills scattered through the immediate vicinity. They are located along the highways so as to have access to the railroad at White Bluff as a shipping point. These mills are quite mobile and stay only a few months in one spot. The sawmill at the eastern edge of the town remains in its permanent location but works intermittently, depending upon price and demand for lumber. These mills give supplementary labor to farmers as well as increase their cash income through the sale of timber under the sustained-yield plan. The lumber business has also attracted many skilled carpenters, many of whom seek work outside the community whenever some big project is in progress in Nashville or surrounding towns.

AGRICULTURE

The farmland in the vicinity of White Bluff, with the exception of small areas of rich bottom land in the Harpeth Valley where corn and tobacco can be grown for years in succession, is not very productive, and even though farming has continued to be one of the major occupations of the people in the peripheral agricultural zone, it has never developed beyond the subsistence stage. About 73 per cent of the total land area of Dickson County is in farms. Only one-fourth of the farmland is in crops. Too great relief and the thin light-colored soils found here on the Highland Rim are not conducive to the raising of clean cultivated row crops and natural pasture is very poor. To increase their cash income most farmers cure meat. This section of Tennessee, as in sections of Virginia, is still famous for the delicious flavor of its country hams. Thus, undoubtedly, White Bluff would never have grown if it served only as a trade and social center for

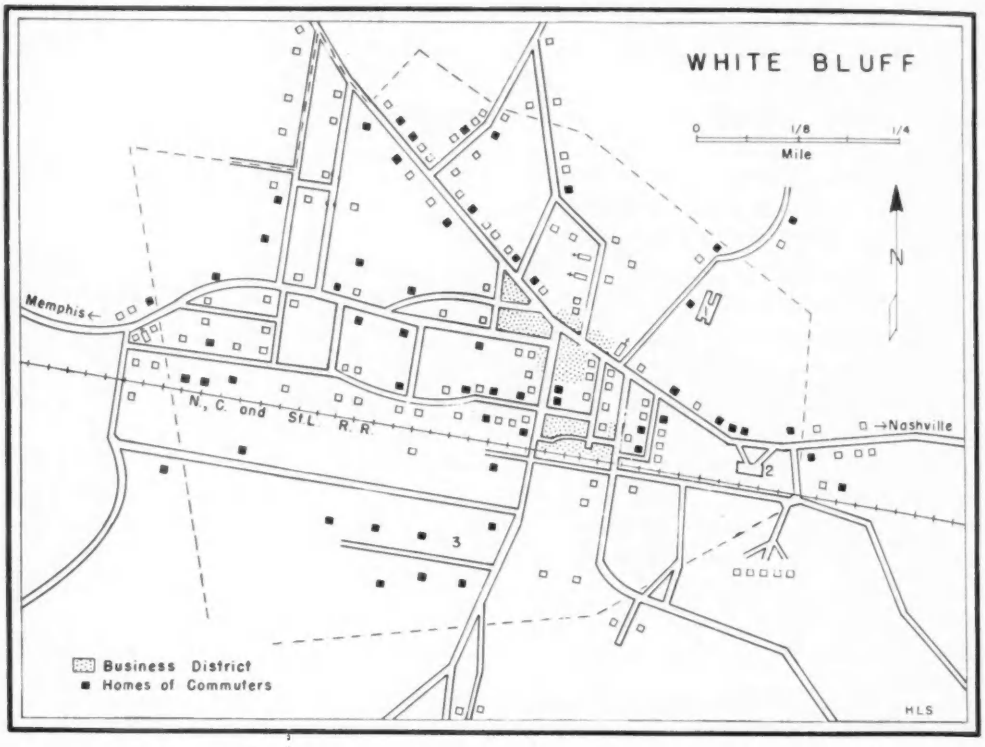


FIGURE 3.—White Bluff, Tennessee. Homes in which one or more members find their source of livelihood outside the city limits are shown in solid black. 1. School Building; 2. Sawmill; 3. Highland Summer Club.

farm people because of a service area too poor agriculturally to support a large trade center.

SUMMER COLONY

The functional service of White Bluff as a summer colony gives an interesting relationship with Nashville, a 40 minutes' drive via Highway 70, as a third function contributing to its growth and development. Incidentally, the presence of the Highland Summer Club, the colony of summer homes in the southern part of town (Figure 3), raises the social quality of the people of the community. These well-kept cottages are owned by leading citizens of Nashville. The colony is in an attractive location and is a quiet restful place for city dwellers in this wooded section on the edge of the Highland Rim. Tennis courts and a swimming pool encourage outdoor exercise in the clear, refreshing plateau atmosphere. Furthermore, the financial support in tax payments to the town increases the services that can be rendered to the citizens of White Bluff.

THE TOWN TODAY: FUNCTIONS

The plurifunctional services rendered by White Bluff at the present time are varied but the residential function seems to be of major importance in holding the present population and attracting most of the newcomers.

To the visitor White Bluff presents an encouraging appearance. Most of the residences would be classed as ordinary but the lawns are neatly kept and there are almost no empty houses. Many new cottages are seen along the three highways entering the town. It

is here that the town seems to be growing most. No colored folk live inside the city limits but there is a row of five Negro cabins just south of the town (Figure 3). Cultural landscape features indicate the importance of the highways as shown by the business houses located where they converge. The residential and transportational patterns of the town are the result of the physical character of the land as they have spread along the narrow ridges of the thoroughly dissected plateau.

One important source of employment in the community at the present time is in the construction of Montgomery Bell Park two miles west of the town (Figure 2). This is one of 37 Recreational Demonstration Areas in the United States and one of three in the state. Approximately 130 persons are given work in the park. Trucks go out each morning to gather up the laborers with about 40 coming from White Bluff and the remainder from the rural areas and the near-by smaller town of Burns.

When completed the park will have two sections, one an organized camping area and the other for day use only. Two lakes and four organized camps as well as historic spots such as the old iron mines and the site of the Laurel Furnace are the chief attractions to visitors. As this park is completed and becomes better known it should attract visitors from a distance and thus White Bluff may share in the increased trade as well as in the present employment made available to numbers of people in the town and rural hinterland.

Today White Bluff appears to be functioning first and foremost as a suburban village. With the introduction of automobiles and busses, access to Nashville via first-class highway, and other improvements in communication, many citizens prefer to live in this village because of the cooler nights in summer and the smoke-free atmosphere in winter on the Highland Rim and commute to their work. Every workday morning several carloads of village dwellers leave for the city where they work. Other persons drive 14 miles west to Dickson to work in the industrial plants there. About 75 persons are employed in these two places.

Thus, suburbanization appears to be the chief cause of recent population growth. As Figure 3 indicates, commuters and their families occupy slightly more than one-third of the residences of the town. The rest carry on retail trade and professional services in the village. With 40 workers in the park, 75 commuting to urban areas, and others employed in paving construction on Highway 70, the livelihood of a high percentage of the 522 inhabitants is accounted for in outside areas.

With its climatic and transportational advantages for commuters, and its recreational prospects, White Bluff may be expected to expand further as a suburban residential center while its agricultural umland will lend stability as a rural trade center, the function which has remained more or less constant since the founding of the village in Civil War days. The transition of the major function of White Bluff from that of a service-station village in a rural area to that of a residential village peripheral to an urban area is typical of the environmental-functional relationships developing in many parts of our nation.

RECENT DEVELOPMENT OF P'YONGYANG, KOREA

Shannon McCune

THE city of P'yongyang (or Heizyo) has dominated northwestern Korea for over three thousand years. At a place where river and hills offered protection in olden times, modern industry and other urban functions find suitable conditions for expansion. The immediate hinterland of the hills and plains of the Taedong (Daido) river basin have played a large role in the development of the city, but in these days the city is serving an ever enlarging sphere of influence in the Far East.

P'yongyang is favored by an advantageous physical base upon which to develop. The city is located at the confluence of the Taedong River with a small tributary. Outcrops of metamorphic and hard sedimentary rocks have provided solid foundations for the old walls and gates; on alluvial plains along the rivers, modern factories require extensive piling. The climate is modified humid continental. Location at 39 degrees N. Latitude and nearness to Asiatic monsoon pressure centers result in marked seasonality. Average monthly temperatures range from 18 degrees F. in January to 75.8 degrees F. in August. Yearly precipitation of 36.3 inches is controlled largely by cyclonic storms which pass over the area from the west throughout the year, and convectional storms of the hot summer months. These disturbances of the monsoon air drifts cause more rainfall in summer when the air is moist and warm. Maximum precipitation comes in July, 9.6 inches, minimum in February, 0.6 inches.

P'yongyang has a history of settlement which reaches far back into legendary times. A mythical character, Tangoon, tentative 2333 B.C., is supposed to have had a capital among the hills to the east of the city. Kija, a Chinese sage, brought 5000 settlers and established himself on the level lands near the junction of the rivers in 1122 B.C. and according to legend was the real founder of the city. Chinese influence remained strong through the following centuries. Two thousand years ago a thriving colony, with a population estimated by grave mounds to have been 1,000,000, was centered across the river to the south. From 918 to 1392 A.D., P'yongyang was the capital of a kingdom which embraced much of northern Korea and southern Manchuria. The

FIGURE 1.—The Location of P'yongyang, Korea. P'yongyang is romanized variously in Korean as P'yongyang or Pyengyang, in Japanese as Heijo or Heizyo.

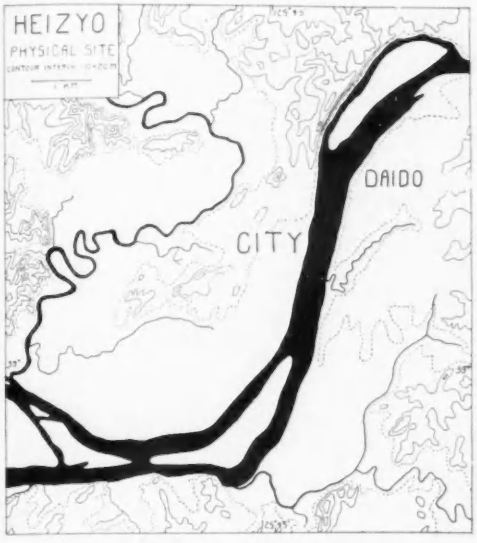


FIGURE 2.—The Physical Site of P'yongyang, Korea. The confluence of a tributary with the Taedong (Daido) River and the hills to the north protected the city. Data was drawn from the topographic maps (Scale 1: 50,000).

inner stone walls were built at that time and the city had a population of 210,000. The ancient urban center was profoundly affected by the movement of the capital to the south in the succeeding Yi dynasty. Waves of invasion by surrounding aggressor nations, among them Tartars, Mongols, Japanese, and Manchus, wrought havoc. A period of seclusion was broken by battles of the Sino-Japanese and Russo-Japanese wars of recent times with their military destruction and accompanying plagues and epidemics. With the fluctuating importance of the city and the different requirements of defense and trade, great changes took place in P'yongyang.

In 1900, the city was constricted largely within its inner stone walls. The outer earth walls to the west and south, built to meet ancient needs, had fallen into disrepair. Narrow, twisting streets, accentuated by high mud walls surrounding courtyards of private homes and public buildings, gave the city an irregular design or pattern. The southern part was crowded, especially around the majestic river gate. On the hills to the north and along the walls buildings were scarce. At the southern and western gates and across the river to the east, settlements had sprung up for travellers arriving after curfew and for storage warehouses. These quasi-suburban developments were small and relatively unimportant. The city was essentially an overgrown market town and provincial capital serving a restricted hinterland.

Economic development has been phenomenal since 1910 when Korea was annexed to Japan. Whether these later changes are purely-Japanese-inspired or are products of the times is not to be considered; nor is the question as to whether the lot of the Korean inhabitants has been improved. Within P'yongyang there was a six-fold multiplication of population from less than 40,000 to

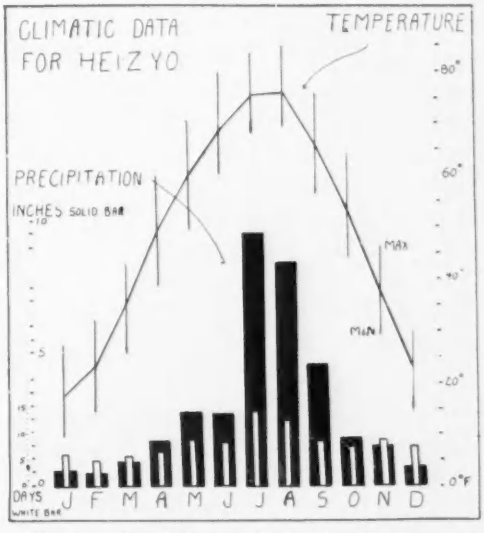


FIGURE 3.—Climatic Data for P'yongyang, Korea. The averages are for the years 1907–1934; the meteorological observatory is located on the hill slopes in the north of the city, 42 meters 125 degrees 41′ East Longitude, 39 degrees 1′ North Latitude. The yearly mean air temperature is 48.5 degrees F; the yearly mean precipitation is 37.04 inches. Source of data: Tables in "30 years' record of the Climate of Tyosen," Government-General Meteorological Observatory, Zinsen, Tyosen, 1936.

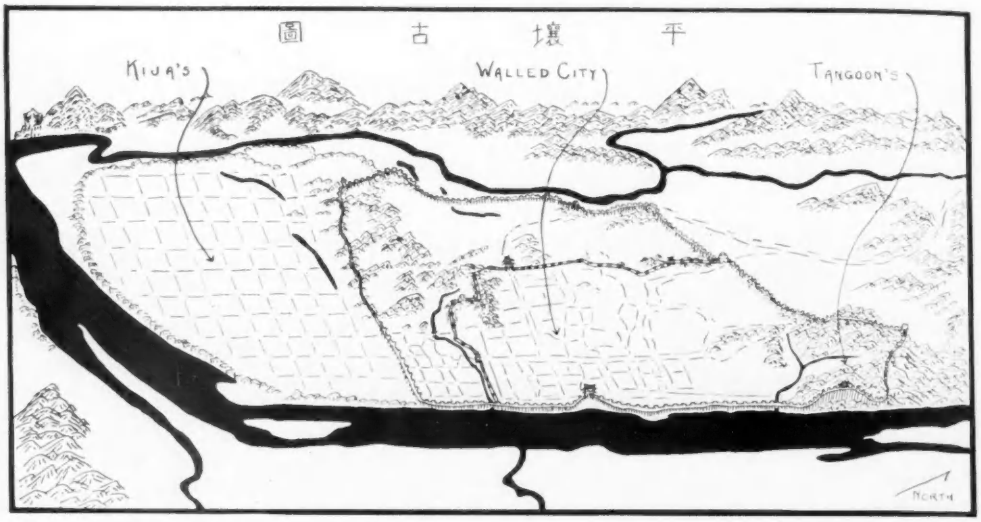


FIGURE 4.—An Ancient Map of P'yongyang, Korea. This drawing is an adaptation of the old scroll maps of P'yongyang. The best example of these is at the Archeological Museum at P'yongyang, a ten panel screen beautifully drawn in color and with great detail.

more than 285,000 in 1940, with equivalent increase of the social and governmental functions of the urban center.

A number of factors have made it one of the major manufacturing cities of Korea. Labor is plentiful and cheap; large markets are close at hand; transportation facilities are adequate; the flow of capital from Japanese sources, both private and governmental, has been great. The nearness of power and raw materials is an added advantage. Some coal is available from coal mines just to the northeast, although most of the production goes to the Navy that operates the mines. A short distance down the Taedong at Kyomip'o is the Mitsubushi Iron Foundry using near-by and imported supplies of iron and coal. Limestone is easily obtained directly east of the city. Hydroelectric projects on the headwaters of the Yalu River to the north are supplemented by a gigantic new project on the river itself, furnishing cheap power. Softwoods from the northern interior of Korea furnish raw material for manufacture of rayon and staple fiber cloth; reeds from swampy areas near the sea are also important. Various products are manufactured from corn produced in the agricultural hinterland. Poor grade cotton is used for textiles. Many industries, such as rice hulling and polishing, are also dependent upon the agricultural lands.

FIGURE 5.—A Coal Boat on the Taedong River. The boat is going downstream past the upper island north of P'yongyang. (Photo by Meijiya. Since this is a military area photographers, especially in recent years, are restricted.)

FIGURE 6.—The Taedong River Gate in East P'yongyang. Since this picture was taken the gate has been repaired in connection with a flood control plan. (Photo by Meijiya.)

The commercial importance of P'yongyang has increased as construction of transportation facilities, including river channel and loading improvements, has spurred activity in the comparatively rich hinterland. The city's strategic military location has led to establishment of land and air bases. Most of this material development has been at the instigation of Japanese. Their concern has been selfish rather than altruistic, however, and today, though comprising only 13 per cent of the total population, they hold a tight grip on the entire life of the city.

There have been significant changes in the form of the city due to increased population and economic importance, and due to new transportation facilities, especially railroads. The main north-south trunk line was built by the Japanese as a part of the military activities in their war against Russia in 1904–1905. Although the station might well have been placed close to the city wall, the site chosen was over a mile outside the south gate. Settlement there was sparse, and land cheap. The island made the bridge less difficult to construct opposite this point. There may also have been more cunning motives, for land between the station and the wall was promptly bought by Japanese who have since profited enormously. This system of out-set location of railroad stations has been universally practiced in Korea by the Japanese.

Settlement with Japanese adaptation to modern style developed around the railroad station. A rectangular street pattern contrasted with that of the old town. Railroad yards and warehouses were built, serving not only the trunk line but branch lines to Chinnamp'o, the port thirty-four miles to the southwest, and to the coal mines, ten miles to the northeast. Primary manufacturing concerns, such as rice-hulling mills and breweries, and industries dependent upon transportation, such as the arsenal and electric light plant, were built upon the plain near the railroad. Military barracks and parade grounds and some of the governmental buildings, occidental in architecture, occupied more land. Japanese residences, with wooden and paper walls and straight tile or tin roofs and enclosed by wooden fences, showed little modification to local con-

FIGURE 7.—The Upper River Gate in P'yongyang, Korea. On the height in the distance is a famous pavilion. The storming of this and other gates was a vital military action in the Sino-Japanese War. (Photo by Meijiya.)

FIGURE 8.—A Ferry on the P'otung River. In the background grass roofed houses are huddled around the P'otung Gate in the west of the city. (Photo by Meijiya.)

ditions. Because of abundant space there was little tendency toward buildings of more than one story.

Modifications of road systems also played their part in development of P'yongyang. A bridge was built across the Taedong River, not to meet the main gate but to the south, outside the old wall. Bridges were more easily constructed over the tributary river, although simple ferries still found passengers. Breaks were made in the wall, and the main south and west gates were torn down. Some gates were left isolated as traffic went around them through nearby breaches, newly made. As demand for building stone increased, the walls themselves seemed to melt.

This introduction of Japanese and modern elements brought changes in the older Korean portions. Within the walls, new public markets were established, home and workshop manufacturing increased, major roads were put through, and a street car line ran the length of the city. Koreans overflowed the walls, especially to the west. To the south they met the Japanese. The wealthier Koreans built residences along hill slopes to the north. These larger homes with heavy wooden pillars and beams supporting tile and slate roofs contrasted with mud-walled, thatch-

FIGURE 9.—A Korean Market-Place in P'yongyang, Korea. In the foreground are the dried-fish dealers, in the left background are earthen jars for pickles. The white clothing is typical of Koreans. (Photo by Meijiya.)

FIGURE 10.—The Main Street of P'yongyang, Korea. This picture was taken on a late fall day. Of note are the various means of transport—bicycle, street car, hand cart, motor taxi, and ox cart. The tile-roofed Korean style building contrasts with the modern white brick and glass structure. (Photo by the author.)

roofed homes of poorer classes. Conspicuous elements in the urban landscape were Christian churches and schools built as American missionary enterprise flourished among Koreans.

Improvements were made along the river. A filtration system on the upper island and reservoirs in the hills furnished an adequate domestic water supply. Dikes were continually heightened to prevent recurring floods, once tolerated. Better docking and warehouse facilities were developed for increasing river traffic. The Taedong is navigable for 130 miles above the city for small boats. A common sight is long log rafts being passed by boats stacked high with brushwood or clay pots. Black coal boats shuttle back and forth from the mines. During the winter the river is frozen solid, however.

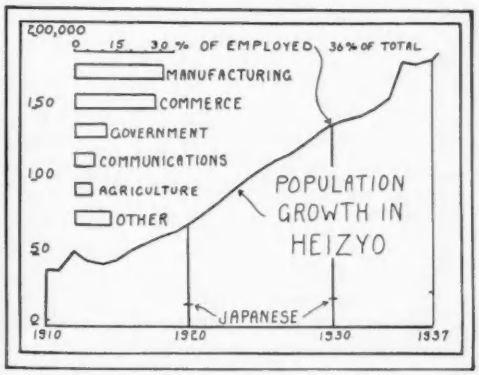


FIGURE 11.—Population Data, P'yongyang, Korea. The line graph shows population growth, the bar graph shows the proportion of the 36 per cent employed engaged in various occupations in 1930. The October 1, 1940 population was 285,000 persons.

In the last decade, with the great growth of the Japanese Empire and its puppet states, and the increased population (especially in the urban centers) in Korea, P'yongyang has become still more important and reflects some further striking changes. Railroad facilities have been increased, in particular on the plain across the river to the southeast. A canal was dug to carry excess water past the city and to aid in development of a port for coast-wise boats. Modern factories, manufacturing staple fiber cloth, corn products, and such articles which fit into the present day Japanese economy, have been constructed here. Residential areas have

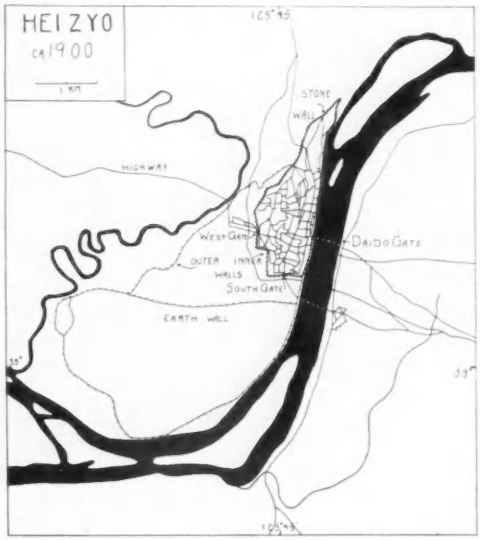


FIGURE 12.—Street Pattern of P'yongyang, circa 1900. The old town was constricted within the inner stone walls.

been developed for the workers and some of the city's surplus. A military and commercial airport has been located to the northeast and a proposed bridge is to connect it with the north end of the old city. South of the main railroad station the fast-growing arsenal and training grounds prohibit much civilian expansion.

Another railroad station has been built on the plain to the northwest of P'yongyang where light industries have become established. This has been an area of great Korean residential expansion and new homes are constantly being built. The meandering tributary is a limiting factor directly to the west and a plan is under way to divert it entirely away from the city. Large freight yards have been developed near this railroad station and also ten miles to the north at the junction of the main line and two recently-constructed branch lines, one to the northern interior, the other to the east coast of the peninsula.

Within the old city through-streets are being built, in some places along the old wall sites. Bus lines make a complete network of the major thoroughfares. Houses are being more tightly packed, and with smaller courtyards. Business and public buildings

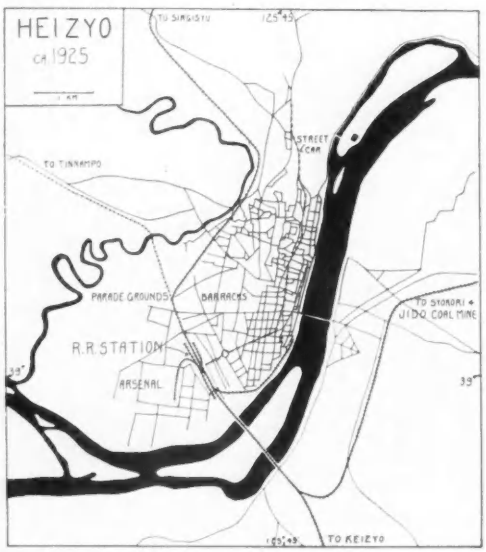


FIGURE 13.—Street Pattern of P'yongyang, circa 1925. The location of the railroad station away from the town has resulted in the building of a new section including arsenal and barracks south of the old town.

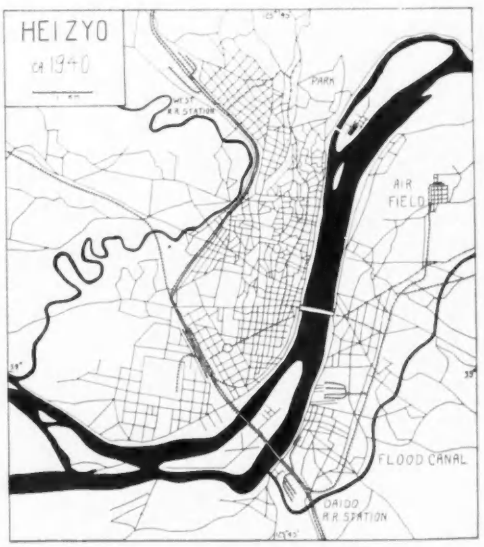


FIGURE 14.—Street Pattern of P'yongyang, circa 1940. The new sections north of the old town and across the river are built up in part because of new road and railroad facilities, in part because of other advantages.

tend toward two and three stories. The streets are crowded and the city hums with activity. It has lost some of its beauty.

P'yongyang today presents a far different areal and cultural form from that of previous centuries; the modifications of the last forty years have been especially significant. Undoubtedly the strategic situation and economically advantageous site will continue to favor the growth of the city and will enable it to hold its place among Far Eastern cities.

AN AGRICULTURAL SURVEY OF PORTAGE COUNTY, OHIO

L. LeMar Stephan

REPRESENTATIVE of northeastern Ohio in rural landscape and in type of farming is Portage County, situated some thirty miles south from Lake Erie. Primarily an agricultural county, Portage is surrounded by counties dominantly industrial, except for adjacent territory to the north. The trend of surrounding cities (Figure 1) toward suburbanization has penetrated parts of the county, giving rise to small part-time farms in addition to providing near-by markets. That this peri-urban development has substantially influenced the present character of land use is manifest. This study investigates the influence of various natural and economic factors in the agricultural land use of the county.

FIGURE 1.—Location of Portage County. The dotted lines divide Ohio into three type-of-farming areas; from west to east they are: corn area; dairy, small grain and hay area; pasture area.

FIGURE 2.—A representative farmstead, substantially built and well kept.

LANDSCAPE

Portage County is part of the dairy, small grain, and hay area of the state (Figure 1). The intensive and specialized farming system employed is evidenced by the number and quality of dairy farms, interspersed with truck patches, part-time gardens, poultry establishments, and by the general farms, each of which emphasizes one or more salable products. Strips of hay, corn, oats, wheat, and potatoes alternate at right angles to the roads, which were laid out in rectangular pattern in the Western Reserve over a century ago. Permanent pastures follow the meandering courses of numerous creeks, their large irregular forms often linked to smaller grazing plots near the road and barn by long fenced-in cow lanes about twelve feet wide. Rotation pastures enclosed by a single electric wire are seen only occasionally, a point of marked contrast with the farm scene of northwestern Ohio. Utilized peat bogs coincide in their areal extent with large and small vegetable fields. Numerous woodland tracts dot the countryside and heighten the level horizon, banding it with green in summer, grey-black in winter. There are few fields temporarily

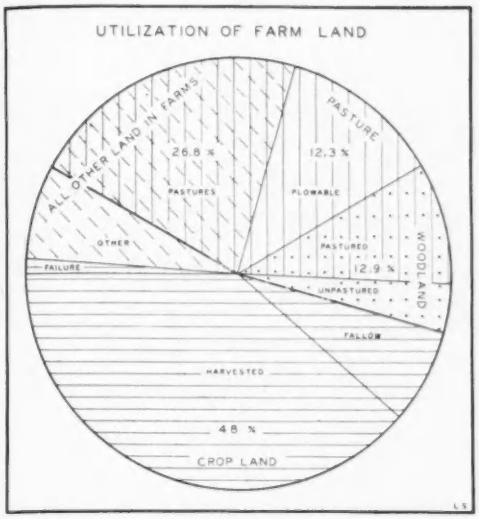


FIGURE 3.—The emphasis on pasture here depicted graphically is conspicuous in the landscape. Many woodland stands are pastured. Variety of soils and market accessibility play large roles in a rather high percentage of crop land harvested.

or permanently idle. The farms average about seventy-five acres and considerable prosperity is seen throughout the county. Houses and barns, while generally over fifty years old and varying in architectural style and color, appear well maintained. Characteristically, farmsteads front the state and county roads, making markets for fluid milk, vegetables, grains, fruit, and poultry products accessible.

Several attributes of the rural countryside of Portage County connote the significance of dairying: fine Holstein dairy herds grazing the lush pastures, silos and numerous dairy barns, milk stands, fenced cow lanes, and corn growing for grain and silage. The importance of pasture land (permanent, plowable, and woodland) in areal extent is depicted in Figure 3, showing in percentages farm land utilization based on the census figures for 1940. The combination of dairying with small grains and hay crops comprises the type of farming area characteristic of central and northeastern Ohio, a region with approximately 24 per cent of the land area, 23 per cent of the farm area, 25 per cent of the crop land, and 26 per cent of the farm population of Ohio. Portage County belongs in the Ohioan sub-region of O. E. Baker's Hay and Dairying Belt.

UTILIZATION OF FARM LAND

Forty-eight per cent of all farm land in the county is devoted to crops (Figure 3). In 1940, 0.7 per cent of the total had a reported crop failure and 7.1 per cent of the total lay idle, so that 40.2 per cent was in crops harvested. This suggests rather high agricultural utilization and successful production. Woodland, both pastured and unpastured, occupies 12.9 per cent of the land in farms. Beech—sugar maple stands predominate over the other types: white elm—red maple—white ash, oak—hickory, oak—maple, swamp oak—white elm, and mixed hardwoods. On the highly productive Wooster soils of the western part of the county, woodland stands are smaller and less numerous. The 1940 census does not differentiate between woodland used for pasture and that unpastured. The amount of each of these classifications has been estimated by assuming that the proportion of woodland pastured was the same as the proportion five years earlier, in 1935.

FIGURE 4.—Stand of timber on Canfield soil. Practically all farms have woodlots, 75 per cent of which are pastured. Fencing of woodlots is therefore common.

In the same way the figure for "all other land in farms" in 1940 has been broken down into two categories: first, pasture that is neither plowable nor woodland; and second, "all other land in farms," with the significance the phrase had in previous censuses, including all waste land, house yards, barnyards, feed lots, lanes, roads, etc. The amount of land in this type of pasture has been estimated by applying the ratio of 1935.

GROSS CASH INCOME FROM SALE OF AGRICULTURAL PRODUCTS

For the past few years dairying has led as a source of gross farm income.

FIGURE 5.—This map was drawn from a new, colored woodland map of the county, dated December, 1939. (Courtesy of Ohio Agricultural Experiment Station, Div. of Forestry.)

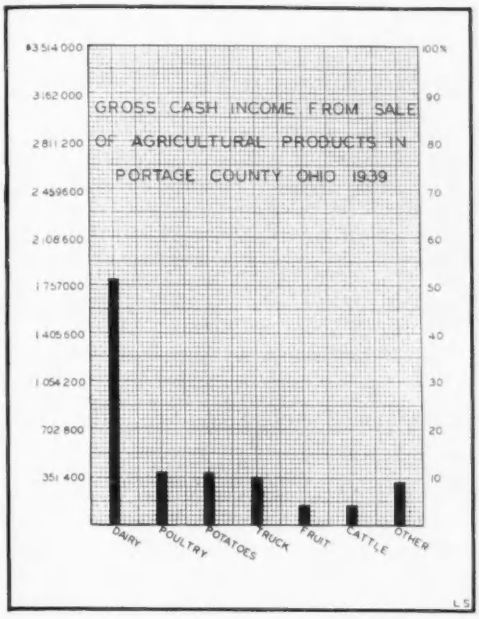


FIGURE 6.—The predominance of dairying shows statistically, as well as in the landscape

In 1939 it accounted for 51 per cent of the total income from sale of agricultural products (Figure 6), or over one and one-half million dollars. This figure is in harmony with the areal importance of pasture and hay crops in the rural scene. The returns from poultry, potatoes, and truck were nearly equal, being 11, 11, and 10 per cent respectively. Sale of fruit and cattle brought in four per cent each. Thus, approximately one-half of the total annual farm income of $3,514,000 was derived from dairying and one-half from specialized farm produce. This represents a larger proportion of income from dairying than is true for the dairy, small grain, and hay area of Ohio as a whole, which from 1933 to 1935 averaged 39.9 per cent of the income from dairying, 12.5 per cent from poultry, 8.4 per cent from wheat, 6.0 per cent from potatoes, 4.5 per cent from truck crops, and from all other sources 28.7 per cent.

A DAIRY LAND

Emphasis in the dairy economy is on production of fluid milk for near-by urban centers. In 1939 the county produced 9,937,371 gallons of milk, of which 8,233,776 gallons were sold to milk companies in Akron, Cleveland, Kent, Ravenna, with minor amounts in Warren and Youngstown. That other milk products are relatively unimportant is shown by the fact that the amount of cream and butter sold totaled only 125,997 pounds (butter fat) and 31,594 pounds, respectively. As seen in Figure 8, 59.3 per cent of the animals pastured were cattle. Holsteins predominate in a ratio of approximately forty to five Guernseys and to one Jersey. Long winters necessitate stall feeding for an average of seven and one-half months, usually October 1 to May 15. Protein concentrates are used to supplement hay, corn, and oats. Fifteen to twenty per cent of the feed must be bought in addition to that grown locally. The nutritious quality of summer pasturage, plus good market demand, makes dairying profitable in spite of the long period of stall feeding.

Hay crops. Of the hay crops, clover and timothy (alone or in combination) dominate, totaling 78.5 per cent in 1940 (Figure 10). The detailed land use maps (Figures 23 and 24) depict the frequent spacing of clover-timothy tracts in relation to other annual legumes and alfalfa.

Small grains. The small grains grown include wheat, oats, rye, barley, and buckwheat (Figure 12). The latter three are insignificant; wheat and oats are the principal small grain crops. Fall-sown wheat is grown mainly for cash; however, during years of low prices it is used for feed. Oats are grown for feed and yield well in a short and cool summer. There is nearly twice

FIGURE 7.—Cows pasturing on Wooster soils. About 75 per cent of cattle in Portage County are Holsteins.

as much acreage devoted to oats as to wheat. This area is climatically suited to commercial production of soft winter wheat, northeast Ohio showing only 5.5 per cent abandonment (attributable to winter and spring injury) for a six-year period, 1924–1930. For Ohio as a whole, the figure for wheat abandonment was 11.9 per cent for the same years. Small grains are needed further as "companion crops" in the seeding of different hays and to furnish bedding straw so vital on dairy farms. The small mapped areas show the areal extent of oats and wheat in the rural landscape.

Corn. In the comparative acreages of grain, as seen in Figure 12, corn assumes first place, with nearly 50 per cent. Of the total acreage of corn harvested in 1939 (27,723), 77 per cent was cut for grain, 21 per cent was cut for silage, and 2 per cent was grazed or cut for fodder. (For Ohio only 3.2 per cent of the corn harvested was cut for silage.) Thus corn, together with small grains, hays, and legumes fit admirably into a dairy economy.

POULTRY

Several poultry farms scattered over Portage County's 521 square miles add variety to the farm economy. Production of chicks, hens, and eggs is often a side farm enterprise also. Largest of the poultry producers is Greenbrier Farms of Garrettsville, boasted to be the second largest broiler-layer poultry industry in the world. Five huge air-conditioned buildings house the 10,000 broilers marketed each month through Cleveland outlets. In addition, there is a flock of 10,000 hens from which Greenbrier advertises "infertile, battery-laid, vitamized" eggs. For market Greenbrier purchases 2,800 chicks every week and annually raises some 2,000 turkeys. Recently two 4,500 gallon capacity fuel oil tanks were installed, an expenditure necessitated by the long winters. In 1939 all of Portage County

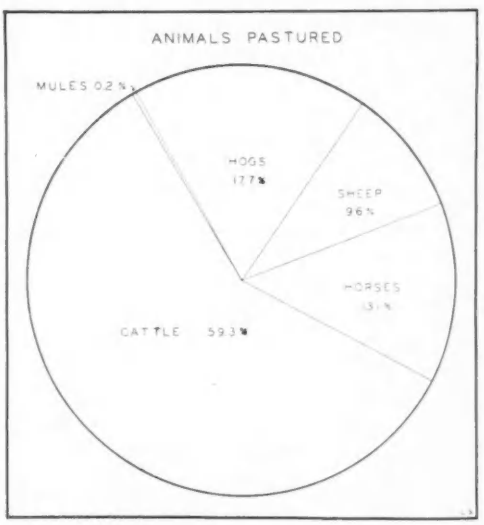


FIGURE 8.—Cattle have continued to be of importance in this county. Hogs have increased; sheep have declined.

FIGURE 9.—Ponies pasturing on Mahoning soils. This specialized grazing activity is a concomitant of proximity to large cities.

marketed 1,344,233 dozen eggs and 211,869 chickens.

POTATOES

Over 4,500 acres of potatoes were grown and harvested for sale in 1939. Their production is in response to suitable climate and soils and available markets. The acreage today is about the same as in 1889; production continued to increase until the period of the first World War at which time some land was shifted from potatoes to wheat. The 1940 census shows that twice as many potatoes are grown on the better drained Wooster and Canfield loams of the western half of the county as in the east. The land use plots mapped (Figures 23 and 24) reveal this same concentration of production. Potatoes are marketed chiefly in Cleveland, Akron, Youngstown, Canton, and Warren.

VEGETABLES

One of the more remunerative types of specialized agriculture is truck farming. A large proportion of the vegetables grown commercially are raised in artificially drained peat bogs. The pitted moraines of the western part of the county afford stream valleys which are also used. Some farmers are, however, growing vegetables on lighter soils, chiefly for local use. The peat bogs and stream valleys must be drained with open field laterals and sub-laterals and not infrequently, in addition, tiled at twenty-five foot intervals. Both early and late vegetables are produced.

Representative of truck farmers is Mr. Tony Bruno of near Suffield, who possesses a twenty-five acre peat bed adequately drained with tiles and ditches. Mr. Bruno fertilizes with 2–8–16 or 5–8–16 mixture for celery production. The first planting is made about April 10 and the crop is marketable beginning June 10 to 15. Harvest continues until early January. Each Monday, Wednesday, and Friday during the marketing season the bleached celery is washed, graded, and attractively packaged in a special packing shed (Figure 15). It is delivered by truck to the Youngstown market.

In 1939 celery led all other vegetables with 37.8 per cent (645 acres) of the total harvested for sale. In the same year sweet corn attained second place with 15.4 per cent (262 acres). Other vegetables of which there were more than fifty acres harvested for sale were carrots, tomatoes, string beans, onions, cabbage, and peppers.

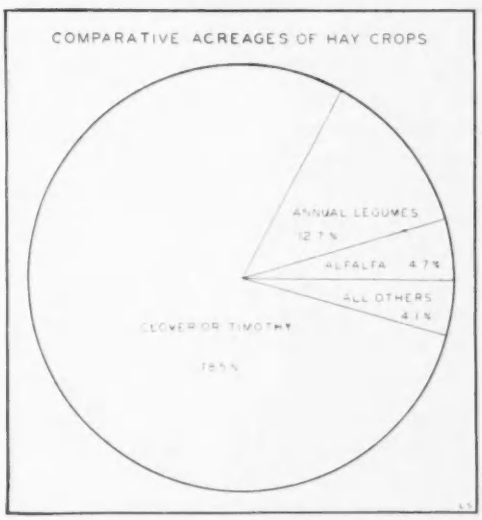


FIGURE 10.—Clover and timothy, separately or mixed, are the chief hay crops. Production of alfalfa is being encouraged as a soil-building crop.

FIGURE 11.—Characteristic hay field showing mature timothy.

FRUITS

At the time of the 1939 census there were 3,091 acres of fruits. Of these, 94 per cent were tree fruits and grapes, and the rest (187 acres) in small fruits (Figure 18). Early settlers in Portage County planted apple trees as early as 1800. Today, 40.9 per cent of the fruit produced is apples. Remnants of old apple orchards on some farms suggest an emphasis in the past. Apple cider and vinegar, as well as apples, are sold from many roadside stands. Vineyards are next in importance to apples, the 8,465 vines amounting to 36.2 per cent of the total fruit trees and vines. Peaches, plums, cherries, and pears are grown in small quantities. Recently, because of a shortage in agricultural labor, it has sometimes been necessary for purchasers of berries to pick them from the bushes.

RELATION OF SURFACE FEATURES TO LAND USE

Of the several factors conducive to the present system and type of farming one is the glacially-modified flat to rolling surface (Figure 20). This flattish character has made for general ease of farming, use of machinery, and has promoted accessibility. Physiographically this territory belongs to the northern glaciated section of the Appalachian Plateau, from which have been derived the several lime-deficient soil types. Use of farm machinery is rarely impeded by the presence of crystalline boulders, differing in this respect from that of New England whose foundation of old granitics and metamorphosed rocks has provided a veritable laboratory for glacial boulders. The preglacial hilly surface was traversed and smoothed by all five ice sheets, the present landscape exhibiting the workings of the late Wisconsin stage. The eastern half of the county is flat, the ground moraine formed from material laid down under the ice sheet of the late Wisconsin drift. Glacial straie as surveyed by Frank Leverett in his famous study of Ohioan glaciology, indicate that the ice was moving in from the northeast. This lobe encountered in Portage County still another lobe of ice coming from the northwest, the deposition of which produced two hummocky and pitted lateral moraines (Grand and Scioto), roughly V-shaped, located in the western part. The pattern of glacial features, varying from flat to rolling, coincides with the diversified soil types and their corresponding stages of maturity. Nowhere is grade or elevation great enough

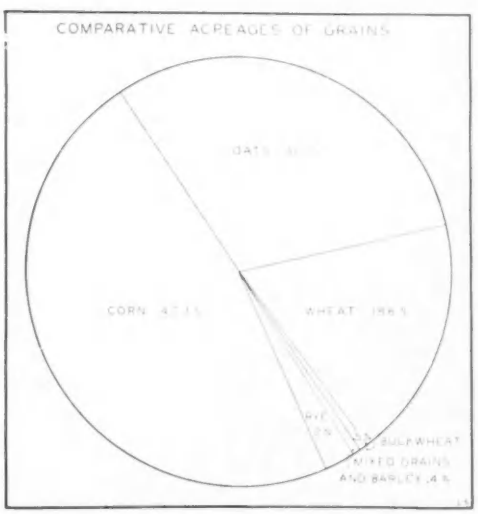


FIGURE 12.—Grain is grown for feed here where stall feeding of cattle is necessary for seven and a half months.

to have seriously hampered construction of roads or railroads. In addition, depositions of gravel and sand within the county have been of inestimable value in surfacing roads and in building railroad beds.

The watershed separating the Lake Erie drainage from that of the Ohio system generally extends along a north-south sector of Portage County, roughly at the eastern border of the morainic country. West of this drainage line, with the exception of a small area in the extreme southwestern part of the county which drains into the Ohio at Marietta, the flow is through the Cuyahoga River into Lake Erie at Cleveland. Grand River, another stream entering Lake Erie, drains a little of northeastern Portage County, and the run-off from the rest forms the Mahoning River, which finally reaches the Ohio. This watershed location early brought water transportation and interwater system routes. During the period of canal building, these "portages" were canalized to provide a through routeway between Lake Erie and the Ohio River. Traces of an old canal remain to recall a former mode of transportation, and on its banks may still be seen remnants of deserted warehouses and ruins of once-thriving canal towns.

SOILS AND LAND USE

The four major soil types in Portage County are derived from the late Wisconsin drift and express varying stages of maturity, largely in response to degree of slope and attendant drainage. The Wooster loam and Canfield silt loam dominate in the western and central sections, while the Mahoning silt loam and Mahoning silty clay loam prevail in the eastern third (Figure 22). Productivity ratings, assigned to each soil type by the Ohio Agricultural Experiment Station, are judged on the basis of the suitability of the soil to produce the crops adapted to the region; for the four above-mentioned soil types the ratings given are 3.5, 4, 6, and 7, respectively. The two maps of land use showing crop distribution (Figures 23 and 24), one on Wooster and Canfield soils and the other on Mahoning silt loam and Mahoning silty clay loam, reveal several contrasts in type and pattern of land use associations. In the selection of areas for detailed mapping no effort was made to choose plots representative of the county as a whole; the areas were selected at random in order that comparison of land use on the four major soil types might be made objectively.

All four of these gray-brown podzolic soils trace their origin to the underlying sandstones, chiefly Sharon conglomerate; shale is interbedded. These materials, reworked by glaciers, furnish the soils

FIGURE 13.—Poultry forms part of the economy on this general farm in eastern Portage County.

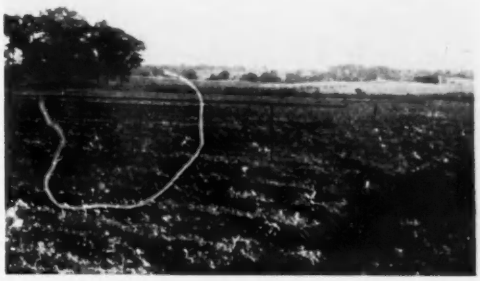


FIGURE 14.—Rows of celery in peat bog. Note provision for overhead irrigation. The tile drainage, supplemented by open ditches, of this field does not show in the picture. Farm of Tony Bruno, near Suffield.

with their attributes of good tractability, moderate fertility, and lime deficiency. The brown Wooster loam is the only mature soil. Developed under excessive moisture but well drained on rolling valley and upland till, the Wooster soils are rated highest in productivity. Occupying an intermediate position between the Wooster and Mahoning areas is the light brown Canfield silt loam, developed on gently rolling terrain with fair to good drainage. Locally varying, because of development associated with gentle slopes of the pitted morainic country to the west, this glaciated pedalfer is so nearly analogous to the Wooster loam in inherent characteristics and productivity that there are no conspicuous differences in land use (Figure 23). The two brownish-gray Mahoning soil types (silt loam and silty clay loam) are immaturely developed on the eastern flattish ground moraine. The productivity ratings of 6 and 7, respectively, vary locally with artificial drainage and with the thickness of friable upper horizons. The A horizons of both are a clayey mottled yellowish-brown and gray; the indurated clay B horizons (below eight inches) are very heavy and retentive of moisture. Mahoning soils are poorly drained, but the expense of tile draining them is a real problem. Heavy rains frequently fill minor depressions with standing water (Figure 25).

Of the four minor soil types, Ravenna loam, Ellsworth loam, Trumbull loam, and peat, only the glacial peat bogs in morainic depressions (all of which are not shown on the generalized soil type map) need be noted for their importance in the production of vegetables.

Another problem in addition to those of moderate sheet erosion and the need for tile drainage is the general lack of lime which has already been noted. Pastures respond well to a superphosphate fertilizer. For crops, complete fertilizers containing nitrogen, phosphorus, and potash are used; the most common mixture is 2–12–6. A higher analysis in the same ratio is also used, either 4–24–12, 3–18–9, or some other.

There are three rotation systems employed as an aid to maintenance of soil fertility. A five-year plan includes corn, oats, wheat, hay, and hay (sometimes the last hay crop is dropped). Some farmers use a three- to four-year system of corn, oats, hay, and hay (last hay crop is sometimes omitted). A two-year plan calls for alternating potatoes and wheat sown with a clover. Either red clover or sweet clover is used, and it is turned under the following year before the planting of potatoes.

Agricultural statistics, by minor civil divisions, for 1940 reveal the same correlations between soils and agriculture

FIGURE 15.—Farm buildings on edge of celery field. The buildings from left to right are the home of Mr. Bruno, a cement-floored packing shed, and a greenhouse. Note linear arrangement of buildings.

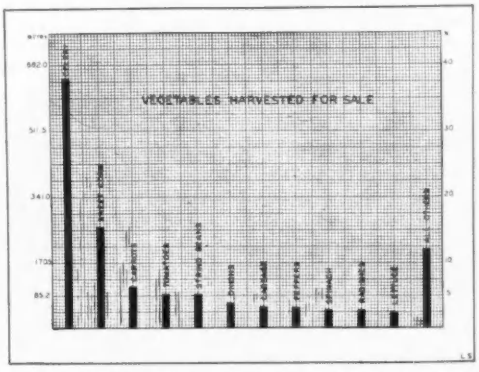


FIGURE 16.—Even if Portage County lacked numerous glacial peat bogs, vegetables would likely be emphasized, for the territory is surrounded by large industrial cities.

Figure 17.—Not all vegetables are commercially produced in peat bogs. Here is a large cabbage field near Edinburg, eastern Portage County.

as did the field mapping. In general, the better soils of the western part of the county (Wooster and Canfield types, Figure 22) produce larger acreages of wheat, oats, and potatoes than do the Mahoning soils of the east (Figure 22). There is little difference in the amount of corn and pasture and the number of cattle and chickens over the county. Slightly more timothy and clover are produced on Mahoning soils and most of the sheep and lambs are there. There is, likewise, more woodland in the eastern part (Figure 5), the amount of woodland being approximately in inverse ratio to the number of roads. Larger crop acreage, more land in farms, and a greater number of farms coincide with the higher productivity ratings of the Wooster and Canfield soils. The average size of farms increases, whereas the average value of land and buildings per acre decreases from west to east.

The rectangular field pattern on the two detail maps stands out well; pastures and woodlots tend, however, to assume irregular shapes because of greater distance from roads and as meandering streams affect their distribution. Both pasture tracts and woodlots are fenced. The vegetables on the mapped areas are grown in response to proximity of nearby towns. Farm homes, buildings, gardens, and orchards characteristically are situated adjacent to roads. The more pretentious farms are not always on primary roads.

Climate and Land Use

Climate, as well as soils and drainage, has played an important rôle in shaping Portage County's agricultural economy. The more critical climatic phases—chilly summer nights, cool spring weather, varying precipitation totals, a short growing season, and much cloudiness—not only affect farm crop yields from year to year, but restrict the very nature of the agriculture to conform to adaptable crops and crop-associations. The combination of dairying, small grains, and hay is ideal here.

The climatic record for Hiram, a north Portage County station where records have been kept for over sixty

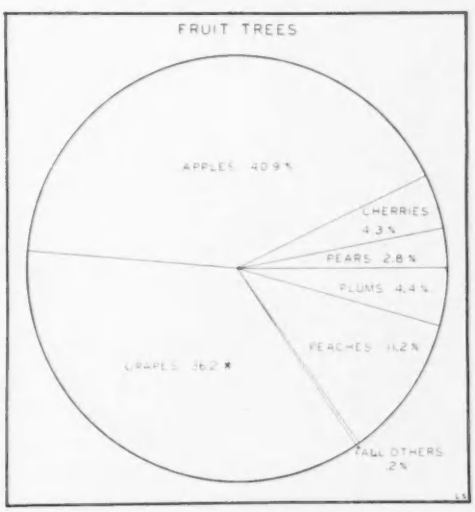


Figure 18.—Apples are still of major importance, even though many old orchards are no longer producing.

FIGURE 19.—This small apple orchard is profitably producing on a gentle slope, where adequate water and air drainage are provided.

years, shows a Dfb type of climate, according to the Köppen classification. The average annual precipitation totals 38.63 inches, (Figure 27), and it may be noted that there is no month which receives less than 2.5 inches. An early summer maximum of 8 inches rainfall in May and June coincides with a rapid advance in temperature, 56.6 degrees to 66.6. degrees F.

The combination of warmth and rain in early summer is conducive to good initial growth of grain and hay crops; there is some danger from too much rain in the harvesting season. The average length in days of the crop growing season (the period between the last killing frost in the spring and first killing frost of autumn) is 150 days. The growing season is, however, satisfactory for the maturing of small grains. Cool nights, particularly during some summers, retard the growth of corn. A long and cold winter, varying in length as is characteristic of the Dfb climatic type, necessitates a rather long period for stall-feeding cattle (October 1 to May 15, on the average). Snowfall averages 45 to 50 inches, annually.

A nutritious grass growth is favored by the amount and distribution of precipitation and by thermal conditions. Fruits and grapes respond well to the climate of northeastern Ohio; the late springs prevent early flowering of fruit and thus minimize the danger of loss from late spring frosts. The restricting character of the climate does not preclude a wide variety of agricultural products.

LAND TENURE

In addition to the productiveness of the land, two other factors have been influential in determining the size of farms in Portage County (an average of 74.2 acres). The influences of the two have been in opposition because the historical circumstances of settlement favored large holdings, whereas proximity to urban centers has favored division into small tracts farmed by an industrial worker and his family. Some 25,450 acres of Western Reserve lands of Connecticut were sold in 1795 to thirty-five individuals. The holdings thus acquired varied in size from 4,207.5 acres to more than 500,000 acres. Actual settlers coming to Portage County were usually New Englanders of some means bent upon establishing estates, rather than poor men seeking a new chance

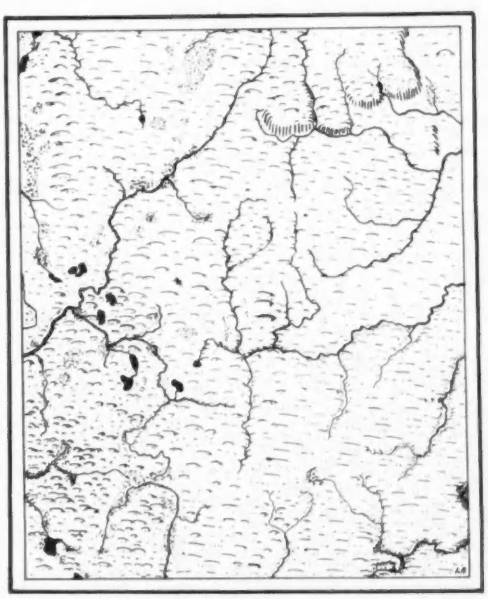


FIGURE 20.—A physiographic diagram showing watershed location of Portage County—the Cuyahoga river system in the west, the Mahoning river system in the east. The pitted glacial moraines of the west contrast with the ground moraine of the east.

on the frontier. Today there remain few large farms; only ninety-four are 220 acres or more. On the other hand, there are 317 of ten acres or less. These small establishments closely spaced along main roads are especially conspicuous on the western edge of the county within easy driving distance of Akron. The two facts of historical circumstance of settlement and the location of part-time farms peripheral to cities in adjacent counties are needed to explain local variations from the generally prevailing inverse relationship between size of farm and soil fertility.

The well-cared-for appearance of both farms and buildings suggest a low percentage of tenancy. The tenants constitute only 15 per cent of the total farmers and of these 64 per cent are cash tenants. This is lower than the state average of 26.3 per cent tenancy. Full owners outnumber part owners and managers more than nine to one. Agricultural practices in the county reflect the care given by owners.

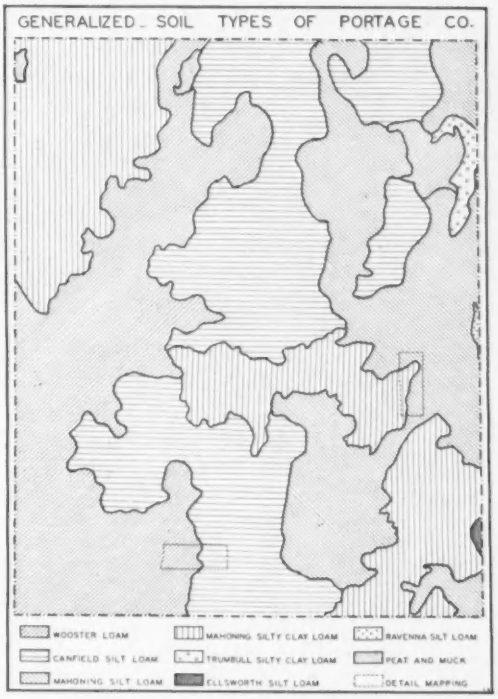


FIGURE 22.—The four principal soils increase in productivity from east to west. (Courtesy of E. B. Mickelson, Ohio Agricultural Experiment Station, Soil Survey Division.)

MARKET ACCESSIBILITY

Of paramount influence on the agriculture of Portage County is the accessibility of markets. Within a thirty-five mile radius from the center of the county lie the chief industrial cities of northeast Ohio: Cleveland, Akron, Masillon, Canton, Warren, and Youngstown (Figure 1); Pittsburgh is less than one hundred miles away. Such concentration of population assures a market for foods, the emphasis on fluid milk, fruits, and poultry products being largely in response to this demand.

FIGURE 21.—Only about 300 yards of this esker remain; the rest has been used for elevating the road bed across this swampy, glacially-widened valley north of Suffield.

Farmers of Portage County are fortunate in having a network of good roads and three railways by which to ship products to market. The Baltimore and Ohio Railroad and the Erie have lines running across the county from east to west, while the Pennsylvania system's line from Cleveland to Pittsburgh cuts across on a diagonal from northwest to southeast. The main highway from Cleveland to Pittsburgh, Route 14, follows approximately the same diagonal, a modern phase of the old Cleveland-Wellsville pike which was conditioned

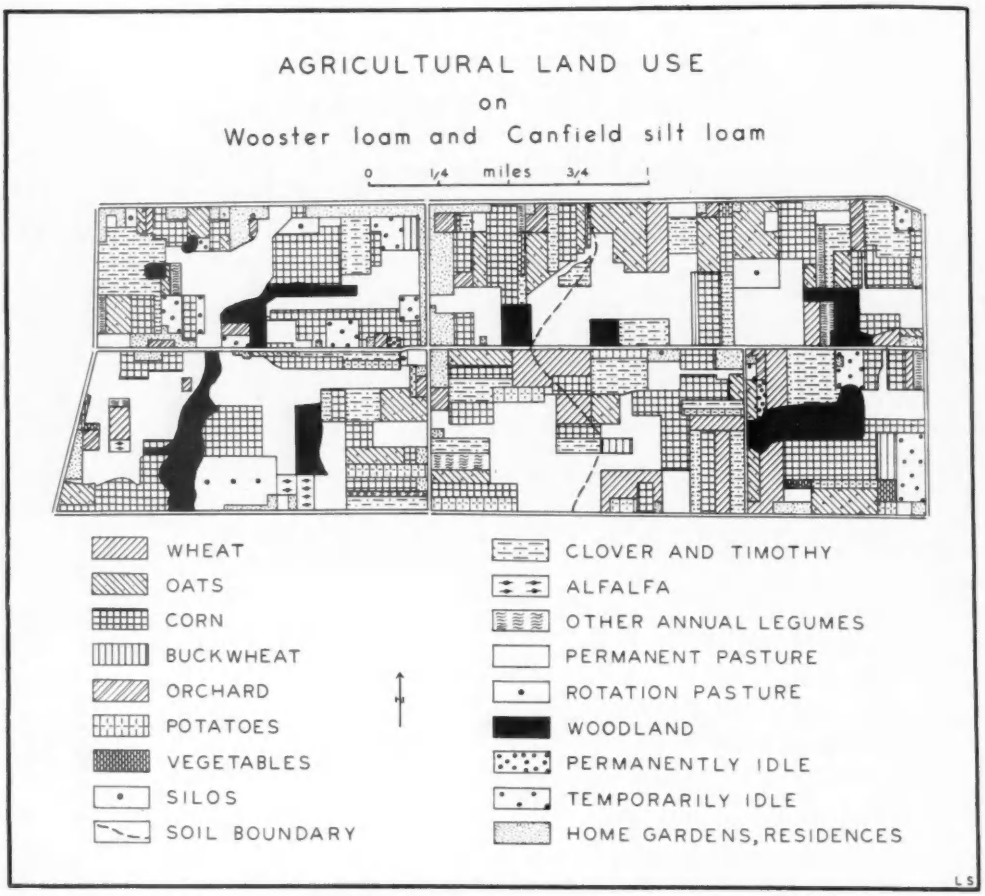


FIGURE 23.—Land cover mapped in July and August, 1941. See Figure 22 for location of land use maps within the county.

for stage coach travel as early as 1826. United States Highway 224 and four paved state highways run east and west bisecting the townships. One of these had its inception in 1812 as a 66-foot military road. Of the north-south highways bisecting the townships, three of the four are paved. In addition to these so-called "center roads" there are usually good gravel roads along the township lines and there are some diagonal roads connecting various towns. Approximately two-thirds of the farms are on paved roads.

Early in its history Portage County was strategically located for water transportation, as its name suggests. The first cash product of the area was cheese which could be shipped via the Mahoning River to the Ohio River and thence to markets. Development of a cheese industry near Columbus curtailed commercial production of cheese. Linseed oil was likewise shipped down the Ohio. Early wheat, apples, wool, and leather were mainly for home use, but small amounts reached markets by water. The county experienced a brief surge of prosperity beginning in 1841 when the Cuyahoga River flowing into Lake Erie was linked with the Mahoning-Ohio river system by the Pittsburgh

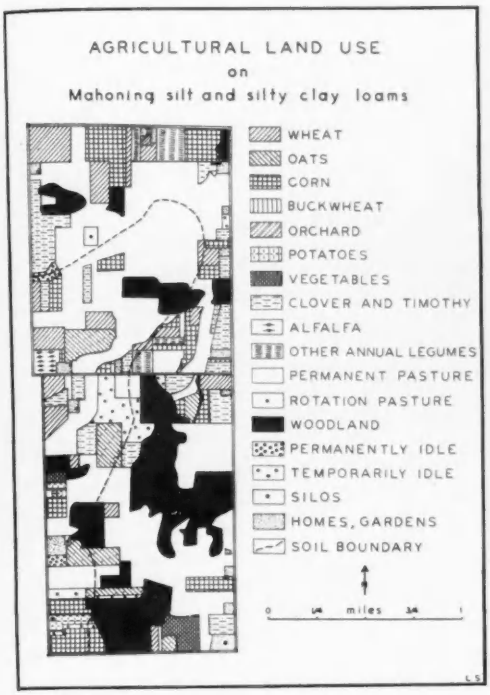


FIGURE 24.—Land cover mapped in July and August, 1941. The Mahoning silty clay loam is to left of soil boundary; the Mahoning silt loam is to the right.

and Ohio Canal. The decade that followed climaxed the era of water transportation and witnessed a mushroom growth of villages along the canal.

Many changes resulted from the advent of railroads in the county. The Pittsburgh and Cleveland, built in 1851, soon drove the canal out of business. Atlantic seaboard cities became markets for both wool and wheat. Wheat production continued to be important through the Civil War period, but the westward extension of railroads that followed brought competition from new wheat lands that Portage County could not meet. Wool declined in importance about the time of the first World War. Today Portage County is devoted to a more diversified farming, providing food for near-by cities and towns.

FIGURE 25.—The flat terrain of eastern Portage County. Shallow open ditches such as the one shown provide inadequate drainage of Mahoning soils.

TRENDS

Under the Federal Soil Conservation program, farmers of the county are being encouraged to undertake production of alfalfa. In 1939 there were 1,447 acres grown for hay, an increase of 65 per cent since 1935. County Agent Rodger M. Thomas reports coöperation in the program and further expansion of alfalfa acreage.

Portage County will probably continue to give up agricultural lands for water reservoirs. Akron already has impounded lakes to provide water for private use and for an industrial water supply, and has available hundreds of acres for additional reservoirs, should

FIGURE 26.—A view of farm land near Randolph, on Wooster soils. A small bed of peat in center of picture is planted in vegetables. Observe the level horizon and numerous woodland patches.

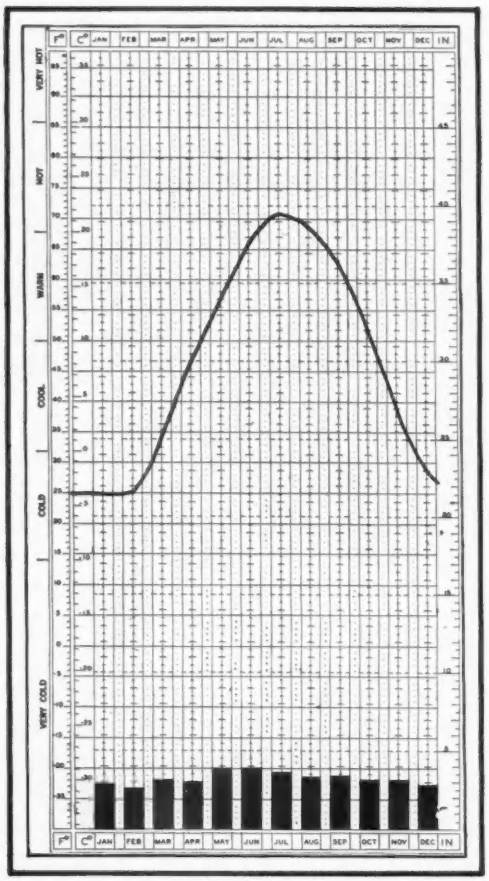


FIGURE 27.—Climatic graph for Hiram, north Portage County. The growing season of around 150 days is significant.

they be needed. At the same time, a projected dam in the Mahoning River will flood approximately 30 per cent of Deerfield township (as well as parts of two other counties) in order to secure more water for the steel industry of Youngstown.

In the center of the county a considerable tract of farm land has been set aside for a shell-loading plant. To the original 21,000 acres has been added 16,000 acres. Not all of these 37,000 acres have, however, been removed from cultivation. Much of the land will continue to be planted in order to camouflage the arsenal.

The present war has tended further to emphasize production of milk, poultry products, pork, and soy beans (for oil). Yields are being increased by use of more fertilizer, not by sacrificing pasture in favor of crops. Portage County is particularly hard hit by the nation-wide shortage of farm labor, because of the congestion of defense industries in northeastern Ohio. At the same time there is increased demand for semi-perishable foods, which are the basis of the agricultural economy of Portage County.

DISTRIBUTION OF SPANISH-AMERICAN POPULATION IN NEW MEXICO

James I. Culbert

NEW MEXICO is unique among the states in that it is officially bi-lingual. Spanish as well as English is spoken in a large part of the state, and in some places is the common language. This is particularly true of the northern counties, and along the Rio Grande. There are two main cultural groups in New Mexico, Anglo-American, and Spanish-American. (Spanish-American as used here refers to white persons of Spanish-mother tongue. "American" refers to so-called Anglo-Americans. This is in conformity with popular usage and has no other significance.) The latter group is made up of descendants of Spanish-speaking people resident in the area when the United States took it over in 1847; descendants of Mexicans who entered the country since that time; and a comparatively small number of recent immigrants from Mexico. With few exceptions, Mexican immigrants have settled in regions where Spanish-American influence has been strong, particularly in the border counties. It should be noted, however, that immigration to the northern counties which formed the nucleus of Spanish settlement of New Mexico has been small.

Census reports of the number of Spanish-Americans prior to 1930 are lacking, and those for that year are incomplete. Estimates have been made, based chiefly on the number of voters with Spanish names. These are necessarily inaccurate, but some made during the decade 1930–40 indicated that about 50 per cent of the state's population was Spanish. Perhaps the most accurate figures are those of the New Mexico Department of Public Health,

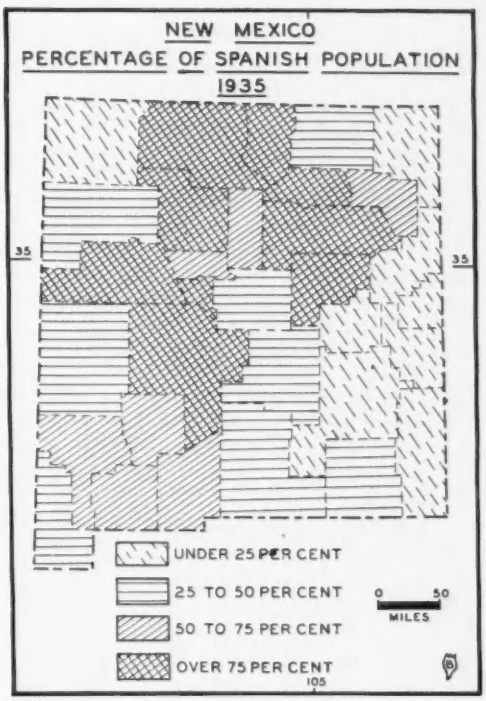


FIGURE 1.—Percentage of Spanish Population, 1935.

based upon the school census in the years 1931–35, which show that of the non-Indian population of the state, 205,812, or 52.3 per cent were of Spanish mother tongue. Since these studies were discontinued in 1935, there are no comparable data for the succeeding years. The census figures for 1940, based upon a sample tabulation of returns from a 5 per cent cross-section of the population show 221,740 Spanish-Americans amounting to 44.5 per cent of the total non-Indian population.

DISTRIBUTION OF SPANISH-AMERICAN POPULATION IN THE STATE

Figure 1 shows the percentage distribution of Spanish-Americans by coun-

ties, on the basis of the school census of 1935. Personal observation leads to the conclusion that there has been no great change in this distribution. The inclusion of a small number of native Mexicans also would not alter either the composition or distribution of population shown. The extent to which this population is concentrated in certain districts is shown in Figure 2. Both figures show that Spanish-Americans are the major element in the population of the northern counties. The areas of densest settlement are along the rivers, especially the Rio Grande. Spanish influence in all of this region is particularly strong. This may account for the statement that Santa Fe is the least American of all the state capitals.

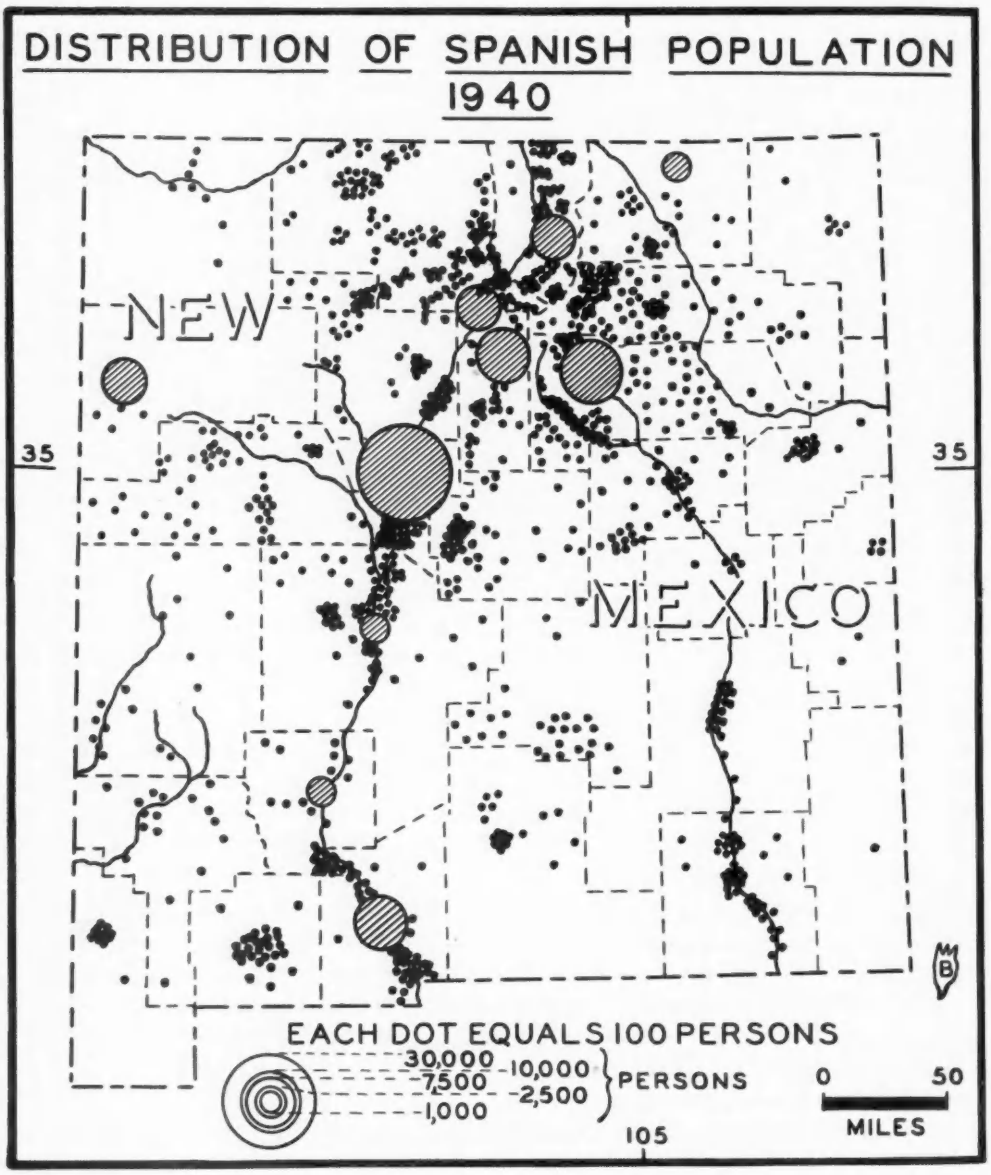


FIGURE 2.—Distribution of Spanish Population, 1940.

HISTORICAL BACKGROUND

Present conditions can be interpreted adequately only by consideration of the geography of the region and its history since Coronado first entered in 1540. The Rio Grande was the principal highway from Mexico, and although the stream was not navigable, its valley was a better roadway than the rugged mountains and arid wastes on either side. In consequence, this was the highway over which passed nobleman and priest, soldier and peasant. Most of the Indian pueblos were located in or near the valley, and here too was the greatest amount of suitable farm land.

Like those of the Indians, Spanish villages were largely confined to the Rio Grande and its tributary valleys, with the principal concentration from Albuquerque northward to Taos. In this district the bottom lands afford the only arable land. The upper Rio Grande Valley was especially favored by many small streams which issue from the mountains, thereby making irrigation possible, even with the primitive means at the settlers' disposal. South of Albuquerque, the lower mountains are drier and support fewer streams, hence settlement there was delayed.

Despite relatively favorable local conditions, there was no great influx of settlers after the first excitement of discovery and exploration had worn off. Before the Indian revolt of 1680, and after almost a century of settlement there were probably no more than 2,000 Spanish inhabitants in New Mexico. Sixty years later, there were but 4,000.

EFFECT OF LOCATION

This dearth of settlers can also be accounted for in part by the consideration of the location of the region and the motives which prompted many of the early expeditions. In the sixteenth and seventeenth centuries the Spanish on the Rio Grande had penetrated farther into the interior of the continent than any other people of European extraction. They had access to no sea coast; there were no navigable streams; the colony was separated from English and French settlements of the East by half the width of a continent, and from the Spanish settlements of Mexico and California by a vast area of mountain and desert. There was little possibility of developing trade, nor any industry save the simple agriculture and stock raising of the irrigated valleys. Trade with Mexico was limited, for the journey from Vera Cruz or Chihuahua was both tedious and expensive. The Rio Grande was the main artery of trade, however limited that may have been, and the one connecting link between the isolated colony and the mother country.

Furthermore, since the earliest expeditions for the settlement of the country were undertaken by the Spanish and Mexicans who were primarily interested in the exploitation of the supposedly great mineral resources, colonization was a secondary consideration. Little gold or silver was found, so except among the friars who accompanied the expeditions, interest in New Mexico waned. It became a neglected province, and its capital, an outpost of the church.

In addition to limiting physical factors, the presence of hostile Navajos, Apaches, and Comanches on all sides discouraged extension of settlement into the plains region which might otherwise have supported a considerable grazing industry. "The Indian, from the days of De Vargas, and for two centuries continued to menace the peace and prosperity of the country and only

after the expenditure of millions of dollars by the government of the United States, was he finally subdued." (Twitchell, R. E., *Leading Facts of New Mexico History*.)

DISTRIBUTION OF POPULATION IN THE COLONIAL PERIOD

Population figures for the Colonial period are only estimates and are frequently given in round numbers. In 1750 the Spanish population was estimated as 3,779, and ten years later at about twice that number. Such estimates were apparently casually made and frequently included the Indians, as most of the settlements included one or more of their pueblos. Within certain limits, these figures are useful in showing the number of inhabitants, but they are of importance in showing their distribution. The figures given for the principal villages include all the people in the surrounding country, and are not

FIGURE 3.—Distribution of Spanish Population, 1744.

for any definite political units. Figure 3 shows that the population then, as now, was concentrated chiefly in the northern Rio Grande Valley. Under almost continual attack from hostile Indians, given little or no support by the mother country. (A. Wislezinus in "A Trip to Northern Mexico," 30th Congress, 1st series Misc. Pub. No. 26 says that after independence the government gave them no protection at all and that outlying ranches were frequently raided.) The limits of settlement at the middle of the century were the village of Chama on the river of that name, and the villages near the present boundary of Colorado, on the Rio Grande.

The period spent under Spanish rule was characterized by a lack of economic progress and little growth of population. However, during the last years preceding Mexican independence in 1821, the Spanish population increased rapidly for the report of the last governor in 1819 and 1820 gives it as 28,436.

GROWTH AFTER MEXICAN INDEPENDENCE

During the early part of the nineteenth century new settlements were established along the Rio Grande south of Albuquerque and also along the eastern slope of the Sangre de Cristo Range, as far as Mora and Cimmarron. With Mexican independence New Mexicans were freed from the restrictions of trade imposed by the Spanish government and commercial relations were established with the United States by way of the Santa Fe Trail. The oppressive monopoly of the merchants of Chihuahua was broken and the way was opened for increased economic progress. Although accurate population figures for the period under Mexican rule are not available, the increase was great for the seventh census, taken three years after American annexation of the territory, shows a population of 61,525, of whom only 772 were born in the United States.

CHANGES AFTER AMERICAN OCCUPATION

The development of trade routes brought about a westward movement of settlers which was destined eventually to have far-reaching effects upon the racial and ethnic composition of the population of New Mexico. Actual settlement, even of the unoccupied districts was slow. Pioneers from the United States were generally merchants or government employees, and located in the established centers along the Rio Grande. In general, immigration took the form of a gradual infiltration which continued for many years.

Population increased, nevertheless, much more rapidly after American occupation than before 1850. The census of 1860 gives the number of inhabitants, exclusive of the County of Arizona, as 87,034, and of these, 79,249 were natives of New Mexico. The increase during the succeeding decade, 1860–1870 was slight, and the census of the later year shows the population to have been 91,784, of whom 83,175 were born within the territory. Since the census reports do not differentiate between persons of American or Spanish-American parentage, it is not possible to make an accurate analysis of the per cent of total population represented by either group. Since the number of persons born outside the territory during the years 1850 to 1870 is known to be small, it is safe to assume that the majority of the population consisted of Spanish-Americans.

With these facts in mind, one concludes that for the first twenty years of American possession, Spanish-Americans comprised at least 90 per cent of

the population of New Mexico. With increased immigration from the East following the building of railroads into the territory, the picture of the numerical relation between the two groups becomes more obscure. For the next half century, one must rely on estimates of persons living in the territory. While these show a considerable difference for any given period, over a term of years they do indicate a progressive decrease in the relative importance of the Spanish-Americans. The years 1900–1910 showed the greatest increase in population due to immigration from the East. A number of factors are responsible for this increase, among them being the development of railroad transportation already noted, the validation of land titles, and the increased stability of the economic life of the territory. An important geographic factor operative during these years was the fact that precipitation over most of the territory was greater than normal. All these are responsible for the rapid settlement of the eastern part of New Mexico, which in turn lessened the Spanish-American influence on that section and gave to the state of New Mexico the dual cultural characteristics which it now possesses.

PRESENT CONDITIONS

In the Rio Grande Valley, and the northern part of the state, American settlement has been confined largely to the urban districts. The more isolated rural areas are predominantly Spanish-American. In the state as a whole, their relative importance as a group has been steadily decreasing, but they still account for a substantial part of the population and are a potent factor in political affairs. This political influence is not the result of voting as a bloc, but because in the Spanish-American counties a larger percentage of voters go to the polls than in the eastern counties. Recent elections show that the vote is almost equally divided between the two major parties. Because of these facts, the vote of the northern counties, not infrequently decides state elections.

It should be emphasized, particularly at this time, that the Spanish-Americans do not form an antagonistic minority bloc. On the contrary, they have been strong supporters of the United States since 1860 and display keen interest in all political affairs. Because of different ethnic and cultural backgrounds there is occasionally friction between the "Anglo" and the Spanish-Americans. For political reasons, the question of "raza" may at times be raised, but the fact that many Spanish-Americans have been elected to important posts in the government seems to indicate that discrimination is economic rather than racial.

CONCLUSION

With better educational facilities, English is more generally spoken, even in the isolated rural districts, than at any previous time. Various governmental agencies are assisting in the improvement of agricultural practices and attempting to raise the economic status of the people who have long been isolated from outside influence. The Spanish-Americans will finally lose many of the characteristics which distinguish them from their neighbors, but their cultural influence upon the state of New Mexico will not soon be lost.

ECONOMIC GEOGRAPHY OF THE BRADFORD OIL REGION

E. Willard Miller

THE Bradford oil region is the northernmost oil field in Pennsylvania. It is located mainly in the north central part of McKean County, and extends a short distance into Cattaraugus County, New York (Figure 1). This region is a part of the unglaciated portion of the Allegheny Plateau. It is characterized by a high, nearly flat upland deeply dissected by stream erosion. Because of the inaccessibility of the area it was passed by in the early westward migrations. It was only when the forests on the eastern seaboard showed signs of depletion that the first lumberman trickled into the dense pine and hemlock tracts of central and northern Pennsylvania. The economy of the region from the first settlements in the early 1800's to 1875 was characterized by lumbering which led to limited commerce but not to manufacturing. As the forests were depleted agricultural activities did not develop, for the soil was unproductive and the land too rugged. As late as 1875 a pioneer economy still prevailed in the region.

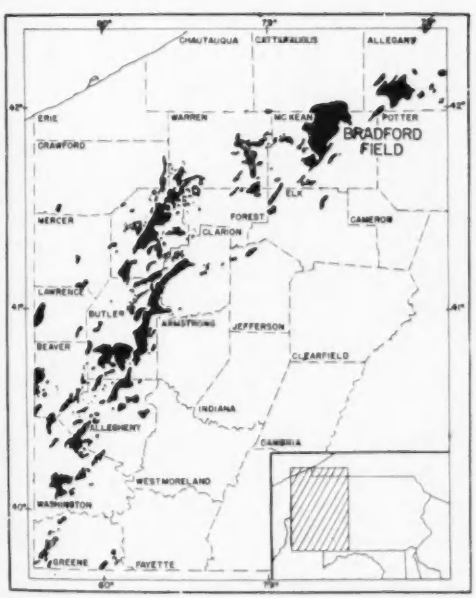


FIGURE 1.—Distribution of the principal petroleum producing pools in Pennsylvania and New York.

PRODUCTION

The Bradford oil pool was one of the last important fields to be discovered in Pennsylvania. From 1860 to 1875, as new sources of oil were sought, a number of small producing wells were completed in the Bradford area, but they gained little attention. Finally on October 5, 1875, a wildcat well began producing at the rate of 300 barrels per day. This was the first indication that a large reservoir of oil existed underground. The drilling in 1876 and 1877 proved that there was an extensive producing horizon in which the number of "dry holes" would be extremely low. As a result thousands of wells were drilled in the next few years which caused a phenomenal rise in production. The peak was reached in 1881 when the output of the field was 22,945,000 barrels. In the three-year period of 1880, 1881, and 1882, a total of 63,000,000 barrels was produced which was 74 per cent of the country's total, and 64 per cent of the world's production (Figure 2). No other field since that time has so nearly monopolized the total output of the crude petroleum of the world.

From 1881 to 1887 a sharp decline in

production occurred. After 1887 the decline became more gradual, but continued to decrease until 1906, when production was a mere 2,022,000 barrels. This was the "stripper well" period which was characterized by increasing cost and diminishing returns. After the period of flush production in the 1870's and early 1880's many wells were abandoned, and in most cases not properly "plugged," so that fresh water was accidentally admitted to the producing horizon. In certain areas where water penetrated the oil sand an increase in production was noted in adjacent producing wells. As a result, the production curve began to rise in 1906. At that date intentional water flooding was illegal, but it soon was practiced by many producers. By 1921 the practice had become so prevalent that the procedure was legalized by the Commonwealth. Scientific methods of flooding now began. The circle flood was first developed, later replaced by the more efficient "line flood," which in turn was replaced by the modern intensive "five spot" flooding (Figure 3).

With the rejuvenation of the field it was readily seen that production of crude oil was no longer the simple operation of earlier times. The Northwestern Pennsylvania Oil Producers Association, founded in 1918, was the first formal organization to study production techniques. In 1929 the Commonwealth of Pennsylvania appropriated $50,000 for oil research to be undertaken at Pennsylvania State College. The depression years of the early 1930's brought the need for still more efficient production measures. In 1933 the Bradford District Research Group was formed under the sponsorship of the Bradford District Pennsylvania Oil Producers Association. This group entered jointly into research with the Pennsylvania State College research staff. As a result of their findings the Bradford field is now considered the testing area for much of the secondary recovery work by water flooding throughout the oil industry.

Production in the Bradford field continued to rise until 1937 when 16,738,688 barrels were produced. This was 85 per cent of the total production of Pennsylvania. Since then production has gradually declined. The present area of the field is approximately 85,000 acres of proved territory. At the end of June 1941 it was estimated that 49 per cent, or 41,500 acres, had been completely developed. Estimates of the remaining 41,500 acres indicate that 29,500 acres will have a recovery of 2,500 barrels or more per acre. For the entire field the estimated reserves on September 30, 1941, were 124,397,000 barrels, which indicates an approximate life of the field of ten years. There are now 41,000 producing wells in the district. Of these, 18,000 are producing from flooding operations, while 23,000 are natural producers. In addition to the 41,000 producing wells there are approximately 21,600 water intake or pressure wells.

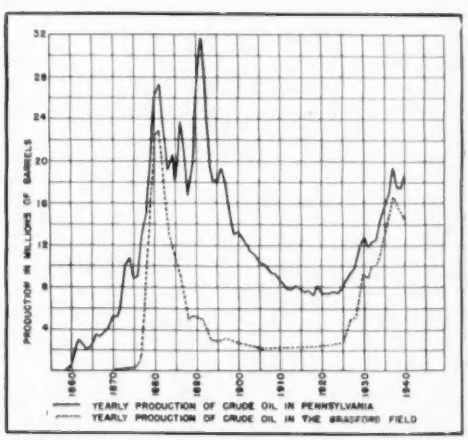


FIGURE 2.—Trends of petroleum production in the Bradford field compared with the total Pennsylvania production. Notice the marked relationship between the two curves from 1875 to 1881 and from 1910 to 1940.

TRANSPORTATION

Since the early oil region was located in a relatively sparsely populated area, the market for petroleum products was outside the producing fields. The development of transportational facilities for crude and refined oils was the most significant technological advancement in the oil industry in the nineteenth century. The first successful pipe line was constructed in 1865, and in the next ten years hundreds of miles of local pipe lines were laid in the oil region. However, the greatest achievements in this phase of marketing began when the prolific production of the Bradford field had to be handled.

This production developed at the time when Rockefeller and the Standard Oil Company were attempting to secure control of the oil industry at its only controllable point, transportation. In spite of the fact that the Standard Oil Company had just completed its mammoth pipe line consolidation, the United Pipe Line Company, there still remained a threat to its monopoly which it met by one of the greatest construction feats of the day. Thousands of storage tanks were built and hundreds of miles of pipe lines were laid in the field. However, the situation was frequently critical, for at times production did exceed transportational facilities and the Standard was forced to impose conditions that aggravated the independent producers. This aroused opposition which developed along two distinct trends. One group attempted to battle the Standard by legal actions; the other group was interested in gaining an independent outlet for their oil. The greatest benefits resulted from the promoters of the latter group.

In 1875 there were no pipe line connections with the eastern refineries. All of the oil was transported out of the region by tank car. In 1878 the Tidewater Pipe Line Company was organized by an independent group to combat the Standard Trust, and proposed to construct a six-inch pipe line over the high Appalachian Plateau to Williamsport, Pennsylvania, where the oil was to be

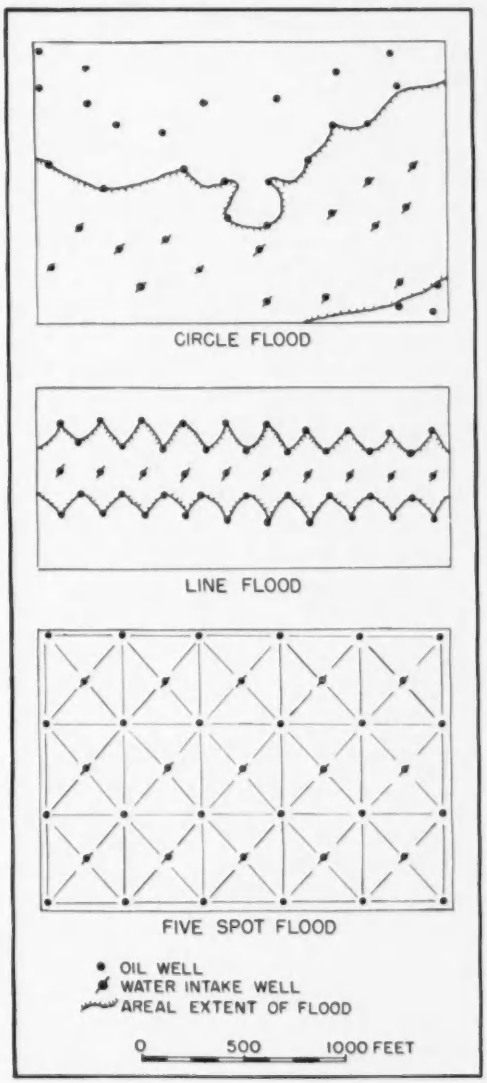


FIGURE 3.—Secondary recovery methods are practiced by water flooding which entails a specialized pattern of drilling. The "Circle flood" was first developed, but was replaced by the more efficient "Line" and "Five spot flood." Water is injected under pressure into the oil horizon from the water intake wells, and the oil is pushed outward to the producing wells.

loaded in 200 newly constructed tank cars and carried to the independent eastern refineries. Construction was begun in January 1879. After many hardships, both from the physical viewpoint and the hostility shown by the Standard, the line was completed in June 1879. Oil had never been pumped so far nor so high before, but the line immediately proved successful. The construction of this pipe line compares with other transportational developments during this era, such as the Suez Canal, the transcontinental railroad, or the Brooklyn Bridge, but being underground it has not been seen and therefore has been frequently disregarded.

As soon as the Tidewater Pipe Line proved successful the Standard interests undertook the construction of trunk lines to Bayonne, New Jersey, and Philadelphia, Pennsylvania. To Rockefeller the success of the Tidewater meant disorder, and from the beginning he was determined to force the new company to capitulate. The battle lasted four years. It culminated in 1883 when the two groups agreed that the Standard would receive 88.5 per cent and the Tidewater 11.5 per cent of the total eastern oil shipments (Figure 4). By this move the Standard virtually completed its monopolistic control over the oil industry.

There were sporadic uprisings throughout the 1880's to challenge the monopoly, but most of them gained little attention. Finally the Producers "shut down" movement of 1888, which attempted to decrease the large surplus of crude oil stored in the region by limiting production and drilling, provided the occasion out of which developed a number of independent organizations. The transportation division of the industry was represented by the United States Pipe Line Company which proposed the construction of a double pipe line from the Oil Region to the seaboard, one line for refined and the other for crude oil. Until this time refined oil had never been transported by pipe line. This pipe line would free the independent refiners of the Oil Region and give them an opportunity to compete with those on the Atlantic Coast. The Standard attempted to block every move of the new company. However, by June 1893 the crude and refined lines were completed from the Oil Region to Wilkes-Barre, Pennsylvania, and the first refined oil was carried through the pipes. The refined pipe line was an unqualified success, not only was the color and odor not impaired, but the flash point had actually been raised by extra agitation of the oil. The Standard immediately began an economic war to discredit the new company. The leaders of the independent movement realized that, if their efforts were to survive, a complete organization of all divisions of the oil industry was needed. After considerable delay the independent groups banded together and formed the Pure Oil Company. This was the first organization to compete successfully with the Standard Oil interests.

In 1911 the Standard Trust was dissolved by court decree and the United Pipe Line was reorganized into a number of smaller pipe line companies. However, the facilities for transporting oil remained unchanged. During the first World War the European market for refined oils declined so rapidly that the United States Pipe Line was abandoned. Today the transportation facilities for the Bradford region are virtually the same as they were at the close of the first period of construction in 1883 (Figure 4). At no time has there been so great a need for improved transportation as during the prolific period just prior to 1883.

REFINING AND MARKETING

The refined products from Bradford crude oil have continually changed with advancing technology. From 1880 to about 1915 kerosene was the principal marketable product. This period in the marketing field was characterized by a generally effective monopoly. To know every detail of the oil trade, to be able to reach at any moment the remotest point, and to control even its weakest factor were the principal objectives of the Standard Trust. During this period probably more than 90 per cent of the refined products disposed of in the United States were Standard brands. At the same time American production exceeded domestic demands so that Standard products were sent to every part of the world. Under this marketing policy the Bradford field was only one of many producing districts.

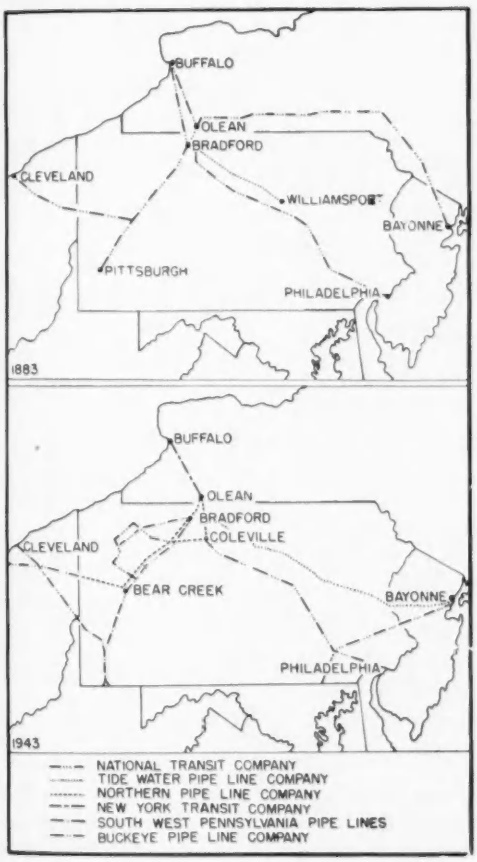


FIGURE 4.—The pipe lines of the Bradford field were largely established during the period of prolific production from 1877 to 1883. The need for transportational facilities was greatest during the boom period so that the facilities remain essentially the same today as in the first period of development.

The invention and development of the automobile made gasoline an important product for the first time, and from 1910 to 1920 it replaced kerosene in the value of sales. It was soon found that the Pennsylvania grade oil yielded a large quantity of straight run gasoline, an excellent fuel for the early low compression engine.

In the Pennsylvania Oil Region the Bradford field was the only area producing in any quantity, so that most of the modern independent marketing policies of the eastern province originated in this district. However, just as the Pennsylvania gasoline market seemed well established a change in the construction of the internal combustion engine resulted in the loss of this market. At a meeting of the oil leaders in the early twenties it was seen that if the Pennsylvania industry was to survive the emphasis must be placed on a different product. From the meeting one fact stood out—Pennsylvania oils were the world's choicest lubricants—but too few motor oil buyers knew about them. To promote the sale of lubricants the Pennsylvania Grade Crude Oil Association was organized in 1923. The Association outlined five basic purposes: (1) to make Pennsylvania products of ever improving quality; (2) to educate the trade and the public to appreciate the qualities of these products; (3) to improve methods of distribution; (4) to conserve the present reserves of crude oil; and (5) to coöperate with other groups within the industry to maintain stability.

There was an immediate response

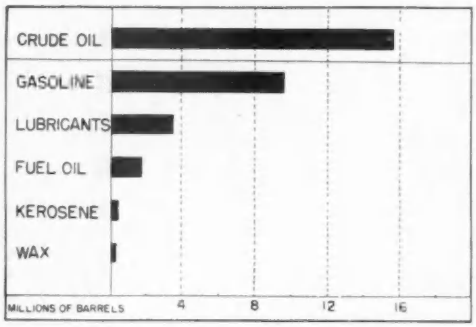


FIGURE 5.—The major products refined from Bradford crude.

from these efforts. The independent refineries began to produce specialty brands of lubricating oil that soon gained a national reputation for quality. As soon as the domestic market was established, a foreign market was also developed which grew to such importance that the outbreak of the present European struggle and the loss of this market completely disrupted the price structure of Pennsylvania oil.

The importance of Bradford crude is indicated by the following statements. A barrel of crude yields 25.72 gallons of gasoline, 9.41 gallons of lubricants, 4.29 gallons of fuel oil, .83 gallons of kerosene, and .74 gallons of wax. The Bradford field alone supplies gasoline for one-fourth of Pennsylvania's automobiles (Figure 5). However, because of the quality of the crude petroleum, specialization in manufacture of lubricants is the most important feature of the industry. A train of 65 ten-thousand-gallon tank cars would represent the daily output of Pennsylvania grade lubricants. Of this total between 35 and 40 cars would represent the proportion from the Bradford field. The lubricants from this field alone would provide for 38 per cent of the nation's cars. Lubricants made from Bradford crude account for about one-tenth of all lubricants manufactured in the United States and are equal to about one-sixth of all lubricants consumed domestically.

PRICE STRUCTURE OF CRUDE OIL

In the Bradford field, as in all petroleum districts, the established price for a barrel of crude oil is of the greatest importance, for price largely dictates whether a field will remain productive or be abandoned. In the history of the Bradford field the price structure has been influenced by a number of factors. From 1875 to 1911 the Standard Oil Company controlled at all times 80 per cent or more of the refinery capacity of the country. It is generally conceded that whoever controls 70 per cent of a commodity controls its price. It was only after the dissolution of the Standard Trust that the normal economic forces of supply and demand began to operate. The demands of World War I resulted in the highest price for a barrel of crude oil since the early 1860's. The price for petroleum in the 1920's exhibited the general unstable business conditions. It also became apparent that the discovery of a prolific field anywhere in the country, and the sale of uncontrolled amounts of oil on the market, could unbalance the entire price structure.

The general business depression from 1929 to 1933 caused a tremendous slump in oil prices. This decline was furthered by the discovery and development of the prolific East Texas field. A gradual recovery began in 1933 and continued until 1937 when the second general business slump occurred. The oil industry was recovering from this depression when the present European War started and the loss of the foreign market caused the price to collapse once again. With the beginning of the American war effort prices recovered, and are now controlled by government regulation. Bradford crude oil selling for $2.98 per barrel is the highest priced crude in the

FIGURE 6.—The village of Bradford at the time of the oil discovery in 1876.

world. Because of its superior quality it receives a premium price of 25 cents above all other Pennsylvania grade oil.

CULTURAL EVOLUTION OF THE BRADFORD REGION

The study of ephemeral landscapes created by the introduction of petroleum activities affords an opportunity for geographical analysis that has attracted little attention to the present time. The Bradford area, because of its limited size and its economic importance, serves the purpose of the geographer who is concerned with this type of region.

The discovery and development of the petroleum industry has been the greatest single factor in the cultural evolution of the Bradford region. The development of the oil industry has not been uniform. There have been three distinct periods. Each of these has resulted in a different expression in the landscape.

OIL BOOM PERIOD

The Bradford field was discovered during a period when it was commonly regarded that the resources of the country were inexhaustible. This led to a policy of uncontrolled exploitation. During the boom period a tremendous change occurred in the utilization of the land. Thousands of people rushed to the area that offered opportunities of getting rich quickly (Figure 11). The surface aspects of the field offered a number of unique and unusual features. The most conspicuous object in the region was the derrick, towering above the houses in the towns, standing in the cleared valley bottoms, rising above the treetops in the woods and crowning the summits of the hills. The large timber tracts were divided into small leases so that in many places ten or more wells were drilled where one would have ultimately recovered more oil. Many of the isolated tracts became centers of intensive activity. Lease roads were cut through the woods over which an almost continuous stream of teams hauled the oil well supplies. Narrow gauge railroads wound around the steep hills carrying men and supplies to the different districts. As hundreds of wells were drilled each month the excitement reached fever pitch. Time was precious, for oil men knew from past experience that flush production was of short duration. As a result of the frenzied activity the whole development indicated disorder, disarray, and indifference

FIGURE 7.—Bradford, showing the growth from 1876 to 1878, at the height of the oil boom.

to all hardships except the one grand objective of producing more oil. In a place where man acted for the day, there was little thought of conservation of natural resources.

The growth of boom towns in the oil region afforded the most spectacular expression of the exploitation of petroleum. Bradford, a small lumber settlement, became the Mecca for the oil men. In 1876 the population of the hamlet was about 550 (Figure 6). By 1879 there were over 9,000 inhabitants, making one of the largest boom towns in the early oil history (Figure 7). The city had the appearance of a gigantic agglomeration of sheds and small cleared areas. The odor of new lumber, fresh paint, and pungent petroleum were everywhere. Hotels, saloons, gambling dens, brothels, and unsavory boarding houses were built by the score.

As the proved territory enlarged smaller boom towns sprang into existence as the result of local excitements. They were much the same as Bradford. All were characterized by hastily constucted frame houses, a business section where boarding houses, saloons, stores, lease offices, and gambling establishments were found. The streets were never paved and became danger spots for both horse and man after the heavy spring rains. On every hand was the evidence of oil shown by the derricks, boilers, tanks, engines, and always the rush to drill more and more wells. During the boom period petroleum activities not only dominated the landscape, but controlled the actions and thinking of the entire population.

PERIOD OF DECLINE OF PETROLEUM INDUSTRY

After five years of intensive development the peak of the boom was reached in 1881. As production declined the intensity of the development decreased. The appearance of the oil field changed rapidly for an oil region is particularly sensitive to economic changes. There was now an orderly development. Producers, who only a short time before gave no thought to conservation measures, began to think of what the future held. However, the signs of decay were soon evident everywhere. Many of the early offset wells were no longer producing and had been abandoned. Worn-out equipment was found scattered in every section of the field. The large tank farms built to store excess production gradually disappeared. The oil industry was most prominently characterized in the landscape by the equipment for the pumping of the stripper wells.

Although the oil industry declined in importance between 1881 and 1906,

it was by no means an era of general cultural decline. The oil boom had brought an immense amount of wealth to the region, much of which was concentrated in Bradford. During the boom there was little opportunity to use this wealth for cultural advancements. Many of Bradford's citizens had seen the gutted environment of the earlier oil towns and wanted to prevent this from happening to their city. In 1882 the Bradford Board of Trade was organized for the specific purpose of encouraging new industries to take the place of the ephemeral oil industry. In the next twenty years a number of new industries were attracted to Bradford. This is well illustrated by the establishment of brick, wood-working, and metal-working plants. The first substantial homes were built about 1885. A combination of civic pride and wealth brought such improvements as a modern hospital, a children's home, recreational facilities, and a library. Thus, the progress was expressed in the visible landscape as well as in the cultural life of the people (Figure 8).

The smaller oil centers did not fare so well as Bradford. All of them decreased in size and many of them disappeared entirely. The towns were built on oil and when this was exhausted the means of livelihood was gone. By 1900 it was difficult to find the site of many of the oil towns that once had several thousand inhabitants. They sprang into existence as mushroom cities and then disappeared overnight without leaving anything by which to be remembered except that each had been a boom town for a few months.

MODERN PERIOD

The cultural impress created by the decline of the oil industry and the attempts to make adjustments to establish a permanent economy were interrupted by the rejuvenation of the oil field. The production increased gradually so that there was no sudden displacement of former land uses such as occurred during the boom period or immediately following the flush phase when there was a sudden decline. The oil activities have grown in importance until the evidence of this industry is found in every part of the region. However, wells being drilled are a less common sight than pumping wells, for individual derricks are not constructed for each well drilled. One drilling outfit moving from one location to another will drill 30 to 40 wells each year, so that instead of 30 or 40 derricks representing the drilling there will be but one.

The pumping of oil wells today is a vastly different problem than it was during earlier periods. The pumping jacks are heavier in order to handle the increased load of water. The problem of natural fuel has become acute and new electric pumping jacks have been installed in many places. The visible

FIGURE 8.—Bradford in 1900. During the 1880's and 1890's Bradford remained the economic and cultural center of the oil field so that it continued to thrive.

FIGURE 9.—A modern electric pumping jack which is replacing the older pumping equipment in many sections of the field.

evidence of secondary recovery work is not striking. Those tracts that have been developed by the five spot system have a definite arrangement of wells, but here the wells are not placed in regard to the cardinal points of the compass or to the pattern of adjacent leases. This is largely due to the ruggedness of the land and the density of the forests.

The rejuvenation of the oil industry has once again caused changes in the activities of the people and the utilization of the land. The population has steadily grown in the oil region (Figure 11). Farming and lumbering, which gained in importance with the decline of oil, have once again been largely abandoned in the oil field proper. At the present time the oil industry employs more than 12,000 people, which represents 80 per cent of the workers of McKean County.

Bradford had developed a fairly stabilized economy, and thus was well suited to assume again its proper function in the industrial and financial heart of the area. In the oil industry today Bradford is known as the "High Grade Oil Metropolis of the World." The evidence of the oil industry is everywhere. The principal buildings on Main Street are oil well supply stores and company offices. The principal industries manufacture oil field equipment. There are pumping wells within the city limits. In the residential sections the large number of recently erected homes is far greater than most cities of comparable size, which testifies to the prosperity of the city. The assessed valuation of property increased from $5,164,000 in 1910 to $12,400,000 in 1939. For the past ten years from 500 to 600 building permits were issued each year with an annual valuation of $225,000 to over $300,000. Approximately 90 per cent of the inhabitants of Bradford are connected with the oil industry in some capacity or other.

The small towns of the field proper have also experienced a remarkable recovery. Since the rejuvenation of the field was controlled by an orderly development, no boom towns have developed. Many of the towns that dwindled to less than 50 inhabitants are now thriving communities of several hundred inhabitants. Again the economy of these towns is based entirely on oil. There is no industry, for it cannot compete with the wage scale of the oil field. When the oil is gone these communities will once again gradually decline and many will disappear.

The succession of events in this area resulted in the development of a combination of features which can be

FIGURE 10.—A water repressuring station in the Bradford field.

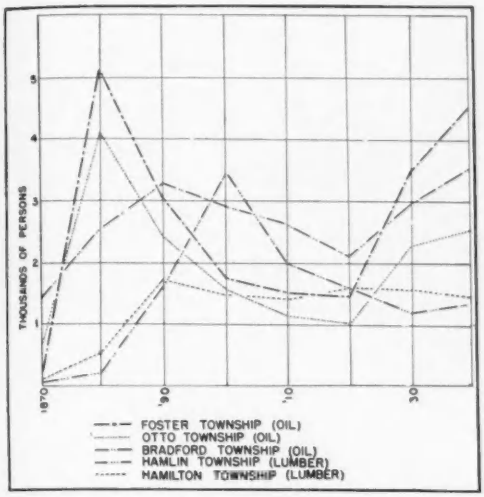


FIGURE 11.—Population trends of oil- and non-oil-producing townships of McKean County, Pennsylvania. The population curve is directly related to the economic condition of the oil industry. (See figure 2.)

resolved into three distinct cultural landscapes. Each of these was characterized by a complex of natural and cultural features which correspond to the particular era in the economic development of the Bradford oil region. The fourth period is in the making. This envisions a steady decline in the importance of petroleum in the economic life of the region. The production curve controls all auxiliary features in the oil industry. Since the economy of the Bradford region is based so predominantly on the exploitation of petroleum any change in the status of the oil industry is immediately felt, for it affects the means of making a living for the entire population. Thus, when the oil industry is gone there must be an adjustment to a new and different means of gaining a livelihood. This change will be expressed in local economy and the present landscape will be relegated to a relict position.

DEVELOPMENT OF DAIRY FARMING IN MISSISSIPPI

Clyde F. Kohn

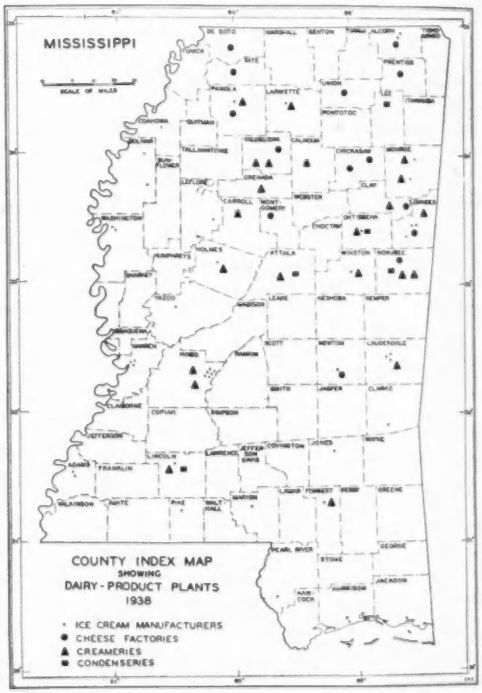
COMMERCIAL dairy farming and other land use practices instigated during the 1930's are continuing to play important rôles in the agricultural economy of the Cotton Belt, despite the fact that wartime economy has once more restored King Cotton to his throne. This is significant, especially since it is doubtful whether or not this old monarch will continue to dominate the national consumer market after the war. To prepare to meet any such post-war decline in the cotton market, therefore, diversified agriculture should be encouraged, and a further development of dairy farming should be stressed.

The spread of commercial dairy farming in areas south of the Mason-Dixon Line is of geographic interest, if only because this region has long been considered unfavorable for animal husbandry. The hot summers are harmful to many well-known breeds of beef and dairy cattle, and the heavy precipitation does not permit timothy hay to be cured satisfactorily. In addition, the region lacks large metropolitan centers which, in the north Atlantic and middle western states, serve as markets for fluid milk, cream, butter, cheese, and meat products. In spite of these handicaps, however, large herds of dairy cattle may now be seen in areas formerly dominated by cotton.

This shift from plantation agriculture to commercial dairy farming is particularly widespread in Mississippi. Recent crop and livestock statistics for this state show marked decreases in cotton production. At the same time, they indicate significant increases in (1) the number of acres of hay and other forage crops, (2) the number of dairy cows and gallons of milk produced since 1929, (3) the percentage of dairy cows in the livestock total, (4) the number of farms on which cows are milked, and (5) the number of creameries, condensaries, and cheese plants throughout the state. Obviously, these changes are indicative of both the absolute and relative importance of dairying in the farm economy.

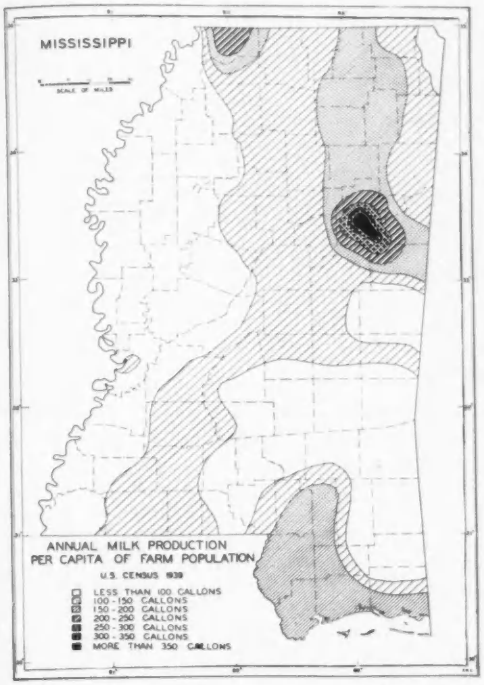
Relative Importance and Areal Distribution

Figures 2 to 5 illustrate these recent developments in dairy farming in Mis-



Index Map, Showing Location of Dairy-Product Plants

Figure 1.—Recently established creameries, cheese factories, and condensaries provide good markets for cream and milk in the newly developed dairy areas of Mississippi. For the most part, these dairy-product plants are located in the north-central part of the state.



ANNUAL MILK PRODUCTION PER CAPITA OF FARM POPULATION

FIGURE 2.—Milk production per capita of farm population has greatly increased since 1929. Much of this increase has resulted from an increased local consumption of dairy products. Information concerning dietary needs is being disseminated throughout the South.

sissippi. The indices used in Figure 4 enable the reader to compare this map with that published by Hartshorne in 1935. (Hartshorne, Richard, "A New Map of the Dairy Areas of the United States," *Econ. Geog.*, Vol. 11, 1935, page 349.) Hartshorne measures the relative importance of dairying in terms of milk production per acre of cropland. He holds that dairy farming, measured both by land use and by value of products sold, is the dominant feature of a farm system wherein the annual milk production is greater than seventy gallons per acre of land used for crops. A ratio of fifty to seventy, he claims, indicates that dairying is probably the most significant of several branches of farming, while a ratio of thirty to fifty indicates that, although dairying is less distinctive than other phases of farm production, there is still a surplus of dairy products sold from the farms. Where the ratio is below thirty, dairying is of minor commercial importance.

With the exception of the last ratio, field studies in Mississippi substantiate the validity of these estimates. In certain sections of the state, however, dairy farming is of definite commercial importance on cotton, general, and self-sufficing farms where only twenty-five gallons of milk are produced per acre of cropland.

Hartshorne's map, based on the United States Census for 1929, shows no area in Mississippi in which dairying is the dominant feature of the farm system, one area where it is probably the most important of several branches of farming, four areas in which it is probably less distinctive than other phases of farm production but where some surplus of dairy products is sold from the farms, and one area in which it is of minor commercial importance.

Figure 4, based on the United States Census for 1939, varies considerably from Hartshorne's map. This more recent map shows two counties (Oktibbeha and Harrison) in which milk production is greater than seventy gallons per acre of cropland, or, in other words, where dairying is the dominant feature of the farm system. In addition, it shows five other sections of the state where milk production is between thirty and fifty gallons per acre of cropland.

This comparison indicates the rapid development since 1929 of commercial dairy farming as an important type of agriculture in many parts of Mississippi.

OTHER MEASUREMENTS

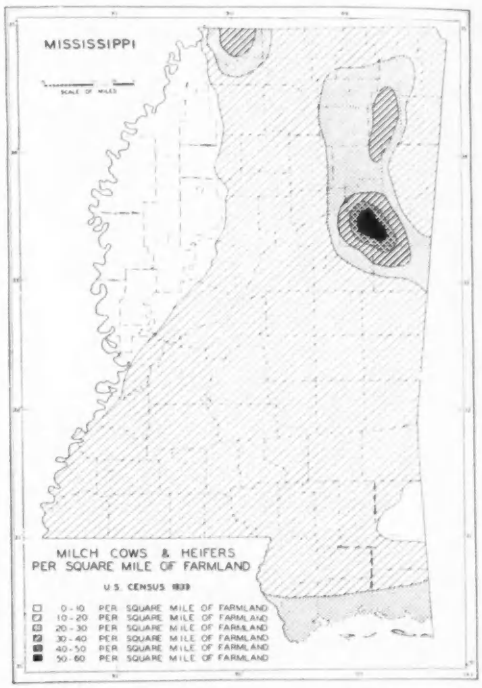
The relative importance of dairying may also be measured by the number of gallons of milk produced per unit of farm population. Figure 2 is based

on such an index. Again it is interesting to compare this 1939 map with Hartshorne's map compiled from earlier statistics. His map indicates that in 1929 milk production was less than one hundred gallons per farm person throughout Mississippi. Figure 2 shows this to be true, however, only for the Mississippi floodplains and the southern sandy hills. Throughout the remaining portions of the state more than one hundred gallons of milk are produced per unit of farm population, and in Oktibbeha County this ratio reaches 367.

Figure 2 also emphasizes the significance of the 150-isarithm in delimiting the commercial dairy regions of Mississippi. Those counties in which the production of milk is more than 150 gallons per unit of farm population have a surplus of dairy products for sale to local markets.

Still other indices may be used to show the development of dairy farming in Mississippi. Observable features, such as the presence of dairy herds, arable pastures, hay fields, hay stacks, silos and dairy barns, creameries, condensaries, and cheese factories give tangible evidence of both the distribution and importance of dairying throughout the state.

Lastly, an index based on the number of milch cows and heifers per square mile of farm land proves to be a very satisfactory measurement of the importance of dairy farming. This index was used successfully by Whitaker to show the development of certain significant dairy regions. (Whitaker, J. R., "Distribution of Dairy Farming in Peninsular Ontario," *Econ. Geog.*, Vol. 16, 1940, pp. 69–78.) Field work indicates that dairy farming is of commercial importance in those regions which have more than twenty milch cows and heifers per square mile of farm land, but of no commercial importance where this ratio is less than ten.


MISSISSIPPI
MILCH COWS & HEIFERS
PER SQUARE MILE OF FARMLAND
U.S. CENSUS 1939
0-10 PER SQUARE MILE OF FARMLAND
10-20 PER SQUARE MILE OF FARMLAND
20-30 PER SQUARE MILE OF FARMLAND
30-40 PER SQUARE MILE OF FARMLAND
40-50 PER SQUARE MILE OF FARMLAND
50-60 PER SQUARE MILE OF FARMLAND

MILCH COWS AND HEIFERS PER SQUARE MILE OF FARMLAND

FIGURE 3.—In those regions where dairying has become an important farm enterprise the number of milch cows and heifers exceed twenty per square mile of farmland.

PRINCIPAL DAIRY REGIONS

Based both on field studies and on the indices presented above, four dairy regions of commercial importance may be delineated in Mississippi. In each of these regions, milk production is more than thirty gallons per acre of cropland, ten gallons per acre of total land, and 150 gallons per unit of farm population. In addition, each has more than twenty milch cows and heifers per square mile of farmland (Figure 5).

1. The *Oktibbeha Dairy Region* includes Oktibbeha, Clay, Lowndes, and Noxubee Counties, and is practically coextensive with the flat or very gently rolling Black Prairie section of Mississippi. Nowhere in this area is the relief

more than fifty feet and often the rises are so gentle that they can be identified only by the blackjack and postoak growths that crown them. The Selma Chalk formation outcrops in this region and has been a major factor in its physiographic development.

Two soil series are commonly recognized in this area: (1) the Houston and (2) the Oktibbeha. The soils included in the latter group occupy the higher areas and have developed under forest cover. They have been leached and are now acid in reaction. In contrast, the Houston soils occupy the lower, more gently rolling areas and are strongly alkaline. They support a dense cover of grasses suitable for hay or pasture.

Owing to these favorable physiographic and soil conditions, the Oktibbeha Region has long been considered one of the best cotton regions of the South. Until recently, therefore, its agriculture has been characterized by a high degree of specialization and by the establishment of large plantations. Present economic conditions, however, have forced planters to discard former practices and to seek more profitable ways of using their land.

These new modes of land use are indicated by Table I. From 1929 to 1939, the number of acres of arable pasture in the Oktibbeha Region increased 44 per cent, while the number of acres of cotton declined 49 per cent. During the same decade the acreage devoted to hay and forage crops increased 97 per cent.

These land use changes have made Oktibbeha County an outstanding dairy center. Indeed, its production of 91 gallons of milk per acre of cropland and of 19.6 gallons per acre of total land compares favorably with milk production in the more familiar dairy regions of Massachusetts, Connecticut, Vermont, New York, Pennsylvania, and Wisconsin.

W. F. Finner (Finner, W. F., "Trends in Dairying by Major Type-of-Farming Regions," U. S. Dept. of Agriculture, *Technical Bulletin*, No. 751, January, 1941) claims that a large part of this development is accounted for by the establishment of herds of three cows, or less, on farms which previously had no dairy cattle. This is true for all counties except Oktibbeha. In this county, the number of farms reporting cows milked has actually declined. From this, it may be concluded, therefore, that the herds already established in 1929 were further increased in the

TABLE I

CROP PRODUCTION

DAIRY REGION		*COTTON*		*HAY AND FORAGE CROPS*	
		Acres	*Per Cent Increase or Decrease*	*Acres*	*Per Cent Increase or Decrease*
Oktibbeha	1939	84,580	−49	77,353	+97
	1929	165,622		39,349	
Gulf Coast	1939	793	−31	2,561	−23
	1929	1,165		3,332	
Memphis	1939	82,385	−36	25,530	+93
	1929	128,129		13,222	
Northern Prairie	1939	123,004	−49	74,498	+177
	1929	243,928		26,891	

decade following. Even today, dairymen in this region feel that additional cows must be included in their herds in order to operate more economically.

No description of the growth of dairy farming in the Black Prairie of Mississippi is complete, however, without some reference to programs fostered by the Mississippi State College, at Starkville. This institution established the state's first creamery in 1885 and organized its present coöperative creamery in 1921. These milk plants, as well as creameries, cheese, and ice-cream plants since established (Figure 1), serve as local markets for the increasing production of dairy products. In addition, the quality of dairy herds in this area, as well as their management, and the skill and interest of dairymen themselves, all reflect close coöperation with county and state agricultural leaders.

2. Farming in the *Gulf Coast Dairy Region* (Harrison, Hancock, and Jackson Counties) differs considerably from that in other parts of Mississippi. Owing to the intensity of autumn rainfall and the sandy character of the soil, cotton has never been an important farm crop in this area. Unlike the trend described above, therefore, the development of dairying in the Gulf Coast area has not involved a change from cotton to hay and forage crops.

The coast region is a low, flat strip of land with soils of the Norfolk, Caddo, and Plummer series. These grade, in the order named, from uplands to lowlands, and are quite similar except for drainage conditions. They are all poor in organic matter, highly acidic, and relatively infertile. Dense growths of hydrophytic trees or marsh grasses cover the poorly drained lowlands, while open forests of pine, with grass, occupy the slightly higher interfluves. For the most part, the region is better adapted to tree and hay and forage crops than to the cultivation of field crops.

Dairying is relatively important in this area (approximately 59 gallons of milk is produced per acre of cropland), although its intensity, or absolute importance, is notably low (only 1.4 gallons per acre of total land). This fact further emphasizes the general unfitness of much of the land for any type of agriculture. Other areas of the state which equal this low proportion include the rough, sandy areas of both the northeastern hills and the piney woods of southeastern Mississippi.

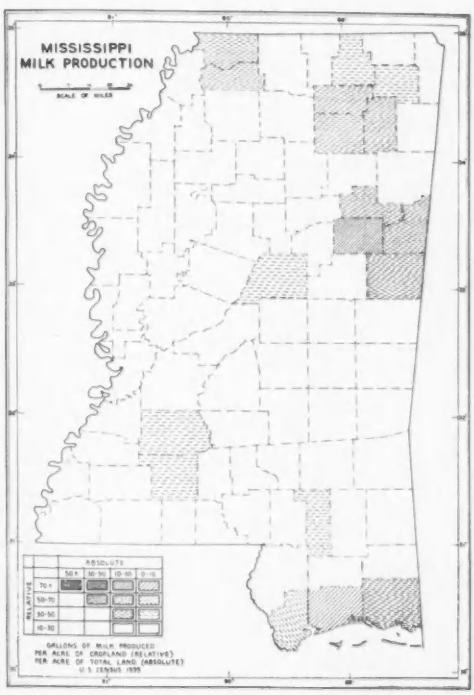
Urban centers, such as Gulfport and Biloxi, provide ready markets for dairy products, and any further expansion of dairy farming is directly dependent upon the continued growth of these centers.

3. The *Memphis Dairy Region* (De Soto and Tate Counties) occupies the northern extension of the loessial bluffs region of Mississippi. The soils of this area have developed from thick deposits of eolian silt and are inherently fertile and relatively inexhaustible under grass cover. Where they have long been cultivated, however, they have become depleted and gullying has developed to an alarming extent. General farming, with emphasis on animal husbandry, is, therefore, replacing cotton. From 1929 to 1939 the acreage devoted to cotton declined as much as 36 per cent, while the amount of land devoted to hay and forage crops almost doubled. The number of acres of arable pasture increased from 82,494 to 143,612, or 74 per cent. Milch cows and heifers averaged 26 per square mile in 1940, and 38 and 13.5 gallons of milk were produced per acre of cropland and per acre of total land, respectively. At present, most of the surplus fluid milk is sold in Memphis.

4. The *Northern Prairie Region* (Tip-

pah, Lee, Prentiss, Union, and Pontotoc Counties) is the fourth area of some importance in dairy farming. This region occupies the more rugged or rolling portions of the Black Prairie section of Mississippi and the Pontotoc Hills. Steep slopes, high ridges, and narrow valleys are common, while prairie areas occupy only a small proportion of the region. The dominant soils are of the Ruston and Orangeburg series. These soils are coarse in texture and have a low organic content. Heavy applications of fertilizer are necessary for crop production and cultivated slopes are often deeply eroded. Much of the land, therefore, is more suited for pasture or woods than for cultivation.

This area is distinguished from the Oktibbeha dairy region because it has a smaller percentage of its land in farms, more woodland, less dairying, and more subsistence agriculture than the prairie section to the south. Milk production averages 177 gallons per unit of farm population, 38 gallons per acre of cropland, and 10.3 gallons per acre of total land. Local condensaries or cheese factories serve as markets for the surplus milk from this region.



MILK PRODUCTION IN MISSISSIPPI

FIGURE 4.—Relative and absolute importance of dairying in Mississippi. The indices used above enable the reader to compare the map with Hartshorne's (ECONOMIC GEOGRAPHY, 11, 1935, p. 349). Note especially those areas where dairying has become the dominant feature of the farm system.

OTHER DEVELOPMENTS

Recent developments of dairying in Mississippi are not confined, however, to the four regions described above. Evidences of the trend toward farm diversification can be seen throughout the state. On sandy upland farms in Amite, Lincoln, and Pike Counties, for example, the relative importance of dairy farming is rapidly increasing, although its absolute importance is still very low. The nearness of these counties to the New Orleans market makes dairying a profitable activity, and it is becoming a supplemental enterprise on many cotton farms.

One area, however, appears on the map as lacking in any development of animal husbandry (Figures 2 and 3). This is the Yazoo-Mississippi floodplain section, world famous for its production of high yields of cotton. The intensity of cotton production in this area, owing to the levelness of the land, the productivity of the loamy soils, and the favorable climatic conditions, precludes the development of other types of agriculture, at least as long as cotton prices remain stable. It might be noted in passing, however, that milk production, although still relatively insignificant, is rapidly increasing in this area.

FACTORS IN THE DEVELOPMENT OF DAIRYING

For the most part, the development of commercial dairy farming in Missis-

sippi is an outgrowth of recent economic conditions. The collapse of the cotton market and the crises precipitated by the fall of cotton prices in 1931 brought southern farmers face to face with economic ruin. Federal aid became necessary, and help was solicited from such New Deal agencies as the Agricultural Adjustment Administration, the Soil Conservation Service, and other organizations.

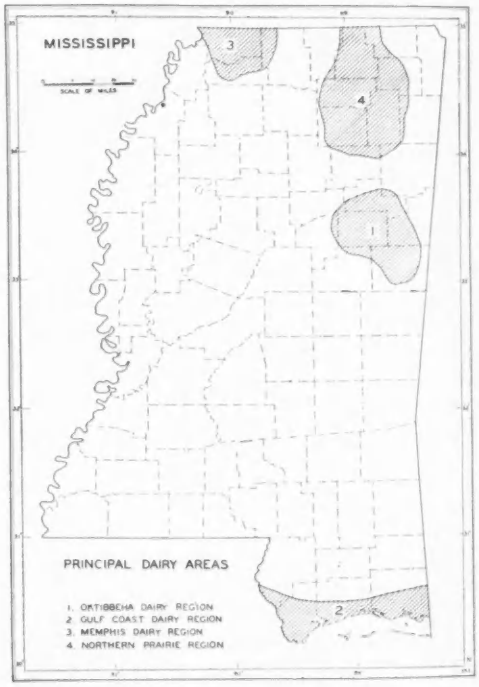
The crop adjustment programs instigated by these organizations have affected the agricultural structure of most southern states to a marked degree. During the last half of the nineteenth century, Mississippi farmers sought to recover the wealth dissipated during and after the War Between the States, by devoting their energies almost exclusively to the production of cotton. This practice subjected them to the dangers inherent in a one-crop economy. The boll weevil scare in the first decade of the twentieth century prompted a movement for diversification. This movement lagged, however, until it was given renewed impetus by the recent economic depression and the New Deal activities. The growth of new crops, the development of new uses for old crops, and a shift to commercial dairying have been but three outstanding results.

These changes have been made possible by the recent growth of urban centers, the construction of improved highways, and the establishment of federal lending agencies. Each of these three forces is deserving of brief consideration.

Until recently, Mississippi has had no large cities. As a result, local markets for agricultural products have been limited. Industrial development, however, is now taking place, and urban centers are beginning to grow at a rapid rate. In 1930, only 16.9 per cent of the total population of Mississippi were classed as urban; in 1940, 19.8 per cent of the inhabitants of the state lived in cities of over 2,500 population. These growing centers now provide sizeable markets for farm products. In addition, recently established creameries, condensaries, and cheese plants afford other outlets for dairy products.

Secondly, until 1934, road development in Mississippi was at a standstill. Since then, a system of paved highways and farm-to-market roads have been built. These have facilitated the movement of dairy products to such outside markets as New Orleans and Memphis.

Finally, during recent years, the establishment of federal lending agencies has enabled farmers to obtain loans for financing farm enterprises. This availability of capital, especially for the



PRINCIPAL DAIRY AREAS OF MISSISSIPPI

FIGURE 5.—Dairy farming has become an important farm enterprise in four sections of Mississippi. In each of these areas, milk production exceeds thirty gallons per acre of cropland, ten gallons per acre of total land, and one hundred and fifty gallons per unit of farm population.

development of animal husbandry, has enabled farmers to follow a more diversified type of agriculture.

In addition to these economic forces, however, both biological and natural conditions have influenced the shift from plantation agriculture to commercial dairy farming. These have either restricted or prohibited the production of certain crops or classes of livestock, or they have necessitated the adoption of definite crop rotations. Several examples may be cited. First, the boll weevil scare, mentioned above, "made a greater agricultural revolution in the South than had resulted from all the teaching and preaching of the previous half-century." (Smith, J. R., and Phillips, M. O., "North America," page 306.) Second, the eradication of the Texas tick has made it possible for dairy cattle to develop in the South, although Bang's disease is still serious in Mississippi and causes much economic loss in the main areas of dairy expansion. Third, timothy hay is not adapted to southern climatic conditions, but annual lespedezas (especially *Lespedeza stipulacea*) have been found useful for forage and soil-improvement purposes. In addition, other principal hay crops include annual legumes, Johnson grass, Bermuda grass, and alfalfa. Guin reports, however, that many other legumes and grasses may be used. (Guin, Marvin, "An Economic Study of Dairy Farming in Oktibbeha and Lowndes Counties, Mississippi, 1936–37," Miss. Agric. Exp. Station, *Bulletin No. 324.*) Among these he includes bur clover, black medic, alsike clover, sping or narrow leaf vetch, hop clover, and red clover, and such grasses as English and Italian rye, tall oat, broome, and orchard.

The production of hay, however, remains a problem in Mississippi. Guin points out that the lack of a well-planned roughage production program is a real weakness in the organization of most dairy farms, and he has found an insufficiency of home grown feeds. He also points out that from 75 to 85 per cent of the roughage is low in quality. As a result, programs teaching the farms to "weed, breed, and feed" properly have been instigated.

Probably the most important problem remaining to be solved, however, is the development of skillful management. The farmers of Mississippi have long been accustomed to routine cotton production, and the shift to commercial dairy farming has been a difficult one to make. As skillful handling of dairy herds is acquired, the development of commercial dairy farming will continue, for most farmers have learned well that a one-crop system is a hazardous land use practice.

FARM REALTY CHANGES IN EASTERN AND WESTERN UNITED STATES

Charles L. Stewart

THE 1,061 million acres in farms in the United States in 1940 are equal in area to nearly nine times the agricultural holdings of France, 17 times those of 1937 Germany, 21 times those of Sweden, 24 times those of New Zealand, 26 times those of England, Wales, and Scotland, and 71 times those of Eire or of Scotland taken by itself.

The 530 million acres of plowable land in farms of the United States is six times the corresponding figure for France, 11 times that of Germany, nearly 12 times that of Poland, 15 times that of Rumania, 55 times that of England and Wales, 57 times that of Sweden, and 96 times that of Finland.

Again in total area in farms the United States has added each year on the average, from 1850 to 1940, one-tenth the area in farms in 1937 Germany. Nearly nine times the area of pre-war Germany has been added to the American farm area in 90 years.

The south-flowing Mississippi River has witnessed the rise of a series of agricultural empires to the east and to the west of it. The size of these domains in respect to total land area, all land in farms, and plowable land area can be gauged by comparing them with various individual countries, mostly European (Table I and Figure 1).

The total area west of the Mississippi, 1,356 million acres, is larger than the area of Europe west of Russia. The total area east of the Mississippi is about two-fifths as large as the area west, which is 549 million acres. In 1940 the 731 million acres in farms west of the Mississippi was 58 per cent of the total area west; and the farming area east of the Mississippi, 330 million acres, was 60 per cent of the total area east. Of the 1,905 million acres in the mainland of the United States in 1935, about 1,061 million acres were in farms.

The growth of farm holdings in the East and West in the United States has been measured by the census at ten-year intervals from 1850 to 1920, and at five-year intervals from 1920 to 1940. How has East compared with West in ninety-year growth? How have later phases of the growth, such as from 1920 to 1940, differed as between East and West?

Let us trace the changes between 1850 and 1940 in terms of farms, of acres, and of values, thus viewing the same real estate from three different angles.

An average ten-year interval between 1850 and 1940 sufficed to see marked shifts in the proportion of farm properties from east to west of the Mississippi (Figure 1). Counting as 1,000 the national total at each decemial census, the comparative amount of the shifting was as follows:

(1) Farms: 38 shifted West per decade; or in the entire period of 90 years, a total of 344.

(2) Acres in farms: 63 shifted West per decade; or 565 total.

(3) Values: 53 dollars worth shifted West per decade; or a total of 476 dollars worth.

In farms and values, the percentages showing shift to the West in the nine decades show a more pronounced drift in that direction during the eight decades, 1850 to 1930. From 1930 to 1940,

TABLE I

LAND AREA AND AREA IN FARM HOLDINGS, 1940, AND IN PLOWABLE USE[a] IN MAJOR DIVISIONS OF THE UNITED STATES, 1939, AND IN CERTAIN FOREIGN COUNTRIES[b]

Divisions of the United States	*Total Land*	*Farm Holdings*	*Plowable Farm Land*	*Countries Affording Near Approaches in*					
				Total Land		*Farm Holdings*		*Plowable Farm Land*	
	(Millions of Acres)					(Millions of Acres)			
Eastern:									
New England (Boston)	40	13	5	England and Wales	37	Eire	15	Finland	5.5
Middle Atlantic (Philadelphia)	64	34	21	Yugoslavia	61	England and Wales	25	England and Wales	9.5
						Scotland	15	Sweden	9.2
								Eire	3.3
East South Cent. (Nashville)	116	77	45	Spain	125	England and Wales	25		
						Sweden	51	Germany[c]	48
East North Cent. (Chicago)	157	114	80	Eire	17	France[c]	124	Rumania	34
				Germany[d]	141			Poland	46
South Atlantic (Atlanta)	172	93	43	England and Wales	37	New Zealand	43	Germany[c]	48
	549	321	194	France[c]	136	Sweden	51		
Western:									
West North Cent. (Omaha)	327	274	183	Norway	77	France[c]	124	France[c]	86
				Sweden	101	Germany[d]	87	Germany[d]	55
				Finland	85	Sweden	51	England and Wales	9.5
				Italy[f]	77	England and Wales	25	Sweden	9.2
								Denmark	6.6
West. South Cent. (Dallas)	276	201	82	Poland	97	France[d]	124	Germany[d]	55
				Hungary	23	Germany[c]	87	England and Wales	9.5
				Bulgaria	25			Sweden	9.2
				Germany[d]	141			Denmark	6.6
Rocky Mountain (Denver)	549	192	44	Mexico	487	France[c]	124	Germany[c]	48
				Uruguay	46	Sweden	51		
Pacific Coast	205	64	25	Japan	94.5	Germany[c]	62	Finland	5.5
	1357	731	334	Greece	32			England and Wales	9.5
				Rumania	73			Sweden	9.2

[a] Land available for crops (harvested, failure, idle or fallow, and plowable pasture) in the United States and the nearest to comparable figures for other countries.

[b] Sources except as otherwise indicated are reports of First World Agricultural Census, 1929–1931, [c] Germany, 1937, [d] Germany, January, 1939, [e] 1908, [f] 1929 (Annuario Statistico Italiano, 1938).

the West added 1.3 points to the 67.6 per cent of the nation's farms it accounted for in 1930, but lost 0.6 points from the 43.2 per cent of the farm acreage and lost 5.4 per cent from the 59.0 per cent of the farm realty values it then contained.

As a result of the persistence of the shifts from 1850 to 1940, the latter date found 42.6 per cent of the farms, 68.9 per cent of the acres that were in farms, and 53.6 per cent of the farm realty values located on the west side of the Mississippi (Figure 2).

The influence of readjustment toward the West—ever to the West until 1930—was felt in agriculture, but not in agriculture alone. It was one of the most influential factors in transportation, commerce, politics, and many other fields.

The fact that some new developments entered the picture between 1930 and 1940, looking toward a stronger eastern phase, may give special interest to an analysis made at this time.

SHIFTING DISTRIBUTION OF FARMS

The number of farms east of the Mississippi River advanced steadily from 1850 to 1910 (Figure 2), increasing over 200 per cent in the 60 years, adding over 43 thousand each year on the average. During the same period farms west increased over 900 per cent, adding over 38 thousand each year. Western

divisions continued to add farms from 1910 to 1930 at the rate of nearly 15 thousand a year. Eastern divisions lost over 18 thousand farms a year from 1910 to 1930, the two decades of most marked abandonment. From 1930 to 1940 the number of Eastern farms declined at an average rate of nearly three thousand a year and since 1935, at 78 thousand a year.

The number of farms east of the Mississippi has always been larger than the number west. Growth in farm numbers characterized both East and West until 1910. If the 1935 census is to be taken at face value, the largest numbers of farms were about that time.

CHANGING NATIONAL FARM ACREAGE DISTRIBUTION

The proportion of the nation's farm land in the five eastern divisions averaged only three-eighths as large in 1940 as in 1850. The Nashville division contained a fifth (19.9 per cent) of the total farm land in the United States in 1850, but only one-fourteenth (7.3 per cent) in 1940. About one-third of all farm land was in the Atlanta division in 1850 (32.2 per cent), but in 1940 less than one-eleventh (8.7 per cent). The most marked relative shrinkage was that of the Boston division, from 6.3 per cent of the national farm land total in 1850 to only 1.3 per cent in 1940.

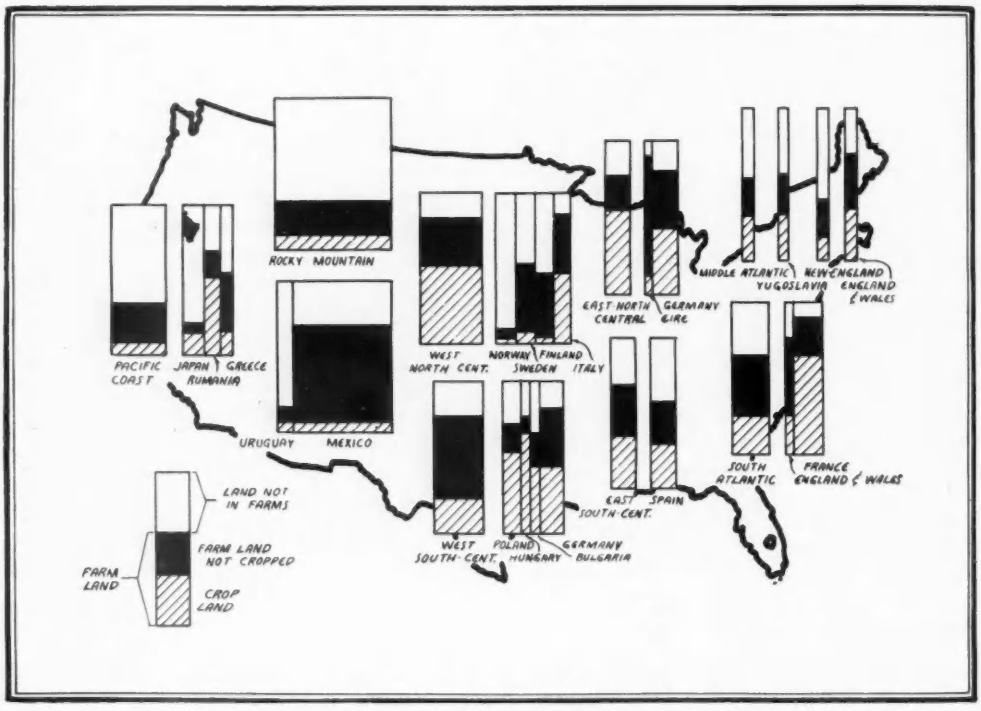


FIGURE 1.—Some regional comparisons of the United States with Foreign Countries. The object of this figure is to match the total land area of our major geographic divisions with that of one or more foreign countries. No account was taken of differences in intensity of use of labor and capital per unit of area of all land in farm holdings or per acre of plowable land alone in this country as compared with other countries.

In percentage of total area in plowable use the divisions showing lowest figures are the Rocky Mountain, 8 per cent; and the Pacific Coast, 11 per cent. For the West as a whole, 25 per cent of the land area is plowable compared with 36 per cent for the East. The total amount of plowable land in the West exceeded by 120 million acres the amount in the East. Intensity of use of plowable land as well as of other land in farm holdings is generally higher in the East than in the West.

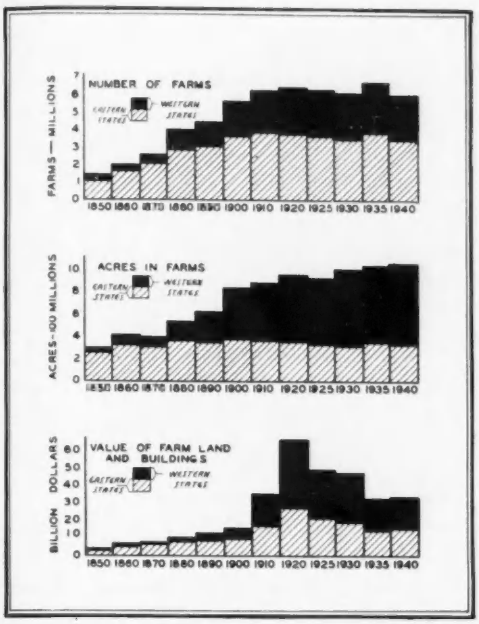

NUMBER OF FARMS
FARMS — MILLIONS
EASTERN STATES
WESTERN STATES
1850 1860 1870 1880 1890 1900 1910 1920 1925 1930 1935 1940
ACRES IN FARMS
ACRES—100 MILLIONS
EASTERN STATES
WESTERN STATES
1850 1860 1870 1880 1890 1900 1910 1920 1925 1930 1935 1940
VALUE OF FARM LAND AND BUILDINGS
BILLION DOLLARS
EASTERN STATES
WESTERN STATES
1850 1860 1870 1880 1890 1900 1910 1920 1925 1930 1935 1940

FIGURE 2.—Farm realty aggregates in the East compared with the West. As late as 1870 the West had less than a fourth as many farms as the East, less than a third as many farm acres and less than a seventh as many dollars of farm realty value. Between 1870 and 1910, Western farms were growing in numbers, in acres, and in values more rapidly than Eastern farms; in fact, by 1910 more than half the nation's farm acres and values were west of the Mississippi. Increases in Western acres continued to 1940. Eastern farm numbers and acres declined from 1910 to 1930 and again from 1935 to 1940. Both Western and Eastern total farm values reached their peaks in 1920. Thereafter the shrinkage in values in the West was more severe than in the East.

Until 1880, the Atlanta division maintained a lead in farm acreage over other divisions, but at that date was equalled by the Omaha division and surpassed by the Chicago division.

In the four western divisions the proportion of the national farm acreage had increased in 1940 to nearly six-fold that of 1850. The Omaha area contained 4.3 per cent of the nation's farm land at the mid-century date and 25.9 per cent in 1940. Most striking was the increased relative prominence of the Rocky Mountain division from 0.1 per cent in 1850 to 18.0 per cent in 1940. Remarkable increases in proportions were registered in the Dallas division, from 6.5 to 18.9 per cent; and in the Pacific division, 1.5 to 6.0 per cent.

The taking of new land into farms was especially active in the Omaha, Dallas, and Pacific divisions from about 1870 to 1900. Similar activities continued from 1900 to 1940, most notably in the Rocky Mountain areas.

The Omaha division had more farm acres than any other division from 1880 to 1940. The Dallas division held second place from 1900 to 1940. The Rocky Mountain division has held third place since 1925.

The fact that the westward shift was progressing at a slackening pace from 1900 to 1930 was but a prelude to the redirection eastward after 1930. It is possible that agriculture's acreage expansion has practically come to a stop at slightly more than one billion acres, and that the first third of the twentieth century will mark the end of the tendency for the center of farm acreage to push toward the center of the nation's land mass in the western Great Plains.

AREA PER FARM IN EAST AND WEST

The changes noted in the farms and farm acreage maps can be better understood in their East-West relations by tracing changes in the average area per farm (Figure 3).

The steep decline in acres per farm east of the Mississippi from 1860 to 1880 was followed by an ever-moderating rate of decrease until 1925 and by substantial stability at about 90 acres per farm from 1925 to date. In 1850 and 1860 the average farm of the eastern divisions was twice as large as in the more recent census years.

West of the Mississippi, farms decreased from 300 acres, on the average, in 1850 to about 150 acres in 1880. From 1890 to 1940 an upward movement carried the average size of farm to nearly

285 acres. Farms of the West were only about 35 acres larger, on the average, than those of the East in 1870 and 1880, but in 1940 were 190 acres larger, the increase in the West from 1880 to 1940 being twice as marked as the decrease in the East.

The long-time tendency toward smaller farms in the East was largely due to increasing density of rural population in a period of rapid increase in total population. During later decades clearing and settling of new land was comparatively unimportant in influencing total areas but resulted in a marked increase in number of small suburban and part-time farming units; thus some decline in average size occurred inasmuch as the increase in number of farms was more rapid than the increase in acres.

The marked decline in average size of Western farms between 1860 and 1880 resulted from extensive homesteading in small units, usually not exceeding 160 acres. In many cases these units proved too small, especially for mechanized grain farming, and the effect of consolidation is shown in the continuous upward trend in acreage per Western farm since 1880.

The national average size of farm moved upward by slow stages after 1880. The West had an effect in raising the national average from 1880 to 1930, and again from 1935 to 1940, but yielded to increased numbers of small farms in the East between 1930 and 1935.

Changes in Actual Acre Valuations in East and West

Valuations per acre and per farm must naturally be considered together. In average valuation of land and buildings per farm the East surpassed the West from 1850 through 1880 (Figures 3 and 4). As long as the average size of Western farms was coming close to that of

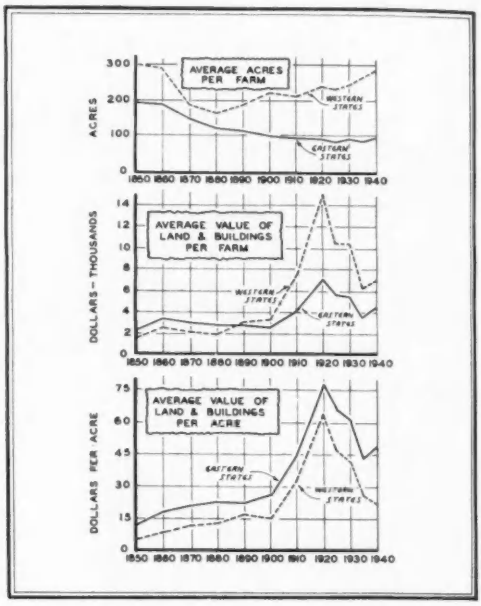


FIGURE 3.—Farm realty averages for Eastern and Western states (absolute amounts). Between 1850 and 1900 the average Eastern farm declined to about half its former size. The average Western farm decreased more rapidly than the average Eastern farm until 1880, then increased to double the size of the Eastern farm in 1900 and to three times its size in 1940. Average value per farm was less in the West than in the East until 1880, but by 1920 had become twice that in the East. From 1920 to 1940 there was shrinkage in the value of both Eastern and Western farms, the decline in the West being greater.

Average value per Western farm acre was half that of the average Eastern acre in 1850 and 1860. In the rapid rise of acre values between 1900 and 1920 the East maintained its margin and fell less than Western values in the decline from 1920 to 1925, but in 1940 the value per acre in the East was 1.6 times the acre value in the West.

Eastern farms—that is, down to 1870 and 1880—realty valuations per farm in eastern divisions kept above realty valuations per farm in western divisions. Values per acre from 1860 to 1920 were usually about $10.00 higher in the East than in the West, but when Eastern farm realty prices moved from around $20.00 an acre in 1870 to nearly $75.00 an acre in 1920, the percentage by which the eastern valuations per acre fell short was cut down markedly. Increased size of Western farms and diminished

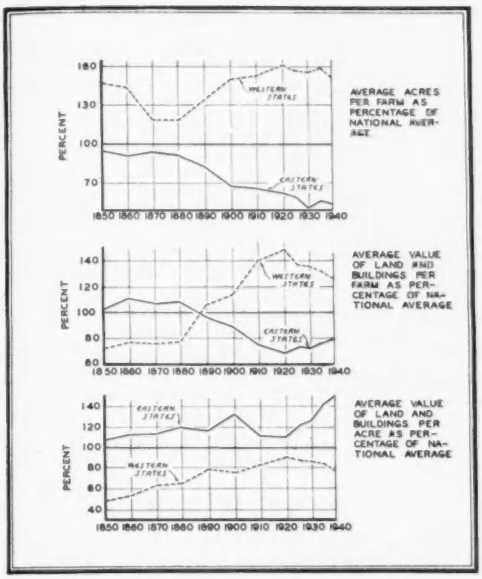


FIGURE 4.—Farm Realty averages for Eastern and Western states, expressed as percentages of national averages. Expressed as a percentage of the United States of America average, the size of Western farms was about 60 per cent above from 1920 to 1935 and 90 per cent above in 1940, while Eastern farms were more than 40 per cent below. The average value of Western farms, expressed in similar terms, was about 25 per cent below the national average prior to 1890, from five to 50 per cent above from 1890 to 1920, and in 1940 over 30 per cent above. In average value Western farm acres advanced from less than 50 per cent of the national average in 1850 to 90 per cent in 1920 and were at 78 per cent in 1940. Although all values per acre were decreasing between 1920 and 1940, those in the East decreased less than the national average, and those in the West decreased more.

relative difference in valuations per acre sufficed to give the average Western farm a larger total valuation than the average Eastern farm from 1890 to 1940. Counting as 100 the total valuation of the average Eastern farm, the average Western farm was valued as follows: 1890, 111; 1900, 128; 1910, 185; 1920, 214; 1925, 188; 1930, 189; 1935, 174; and 1940, 159. The average valuation of Eastern farms in 1940 was 62 per cent as high as in 1920 and of Western farms only 46 per cent as high. From 1935 to 1940 Western farms increased about one-fifth and Eastern farms about one-tenth.

A Mode of Expressing Relative Values

Changing valuations of farm realty per acre in both East and West render difficult the gaining of a correct impression as to how the various divisions and states have shifted relatively to one another. Perhaps the simplest way to clarify the changing map of acre values is to use the national average valuation per acre as 100 at each successive census and to express the acre valuations of the various divisions and states as index numbers. The relativities thus shown correspond to what might have been shown in the actual dollar valuations, if the dollar had been stabilized so as to afford constant power to purchase the average farm acre of the United States.

The downward shift in the index valuation of real estate per acre in the several divisions showing decline is, of course, offset by equal upward shift in other divisions. The same holds for individual states when treated on the same basis.

Farm real estate valuations per acre have held to higher levels in East than West, both prior to the great inflation culminating in 1920 and since (Figures 5 and 6). In 1940 the average acre valuation in the West, $24.70 per acre, was slightly above the point to which a continuation of the 1860–1900 trend would have carried it, whereas that of the East, $47.22, was approximately $10.00 an acre higher than a corresponding projection of the 1860–1900 trend line would have suggested.

Change in Eastern Farm Realty Value Ratios

Valuations of farm real estate per acre in 1940 stood highest in the Chicago, Philadelphia, and Boston divisions; that is, above $60.00. The Philadelphia average had been below that of the

Chicago division from 1910 to 1930. The Boston area average had come close to that of the Philadelphia division in 1935, but in 1940, and from 1930 to the earliest value census, had been below. Since 1860 there was only one date, 1935, when the average value per acre of farm land in the Chicago area was less than that of the Boston area.

The Nashville division had acre valuation averages below the national average from 1850 to 1940, and the Atlanta division, until after 1940. The decline in their relative prominence was marked between 1860 and 1870, but the Atlanta area recovered its 1860 position in 1900 and the Nashville area, in 1930.

Increases in relative prominence in farm realty values, 1920–1930, and again, 1930–1940, occurred in all five eastern divisions. Tendencies are thus shown in land values to retreat more slowly in the East than in the rest of the country and to advance more since the tide of value movement has turned upward.

EASTERN AVERAGES CONVERGE; WESTERN AVERAGES SPREAD

On the whole the eastern divisions came nearer to averaging alike in 1935 and 1940 than at previous census dates, the interval between the division of highest and that of lowest valuation, which spanned over 220 percentage points, 1870, had shrunk in 1940 to less than 110 percentage points. The rising relative standing of the Atlanta and Nashville areas and the decline in standing of the Philadelphia area afford most of the explanation for this change.

The somewhat wider separation among eastern districts since 1930 is in response to several developments. Inflationary conditions prior to 1920 had raised the national average valuation of farm land and buildings per acre. This effect was notable in the north central states both east and west of the Mississippi River. More recently, premiums have accrued to farm real estate located in the more thickly populated portions of the United States, probably arising from (1) higher proportions of the farm area being near enough to cities to possess residential and other values in addition to agricultural values, and from (2) higher proportions of the farm area being served directly by all-weather highways as well as from (3) other advantages in producing for near-by markets.

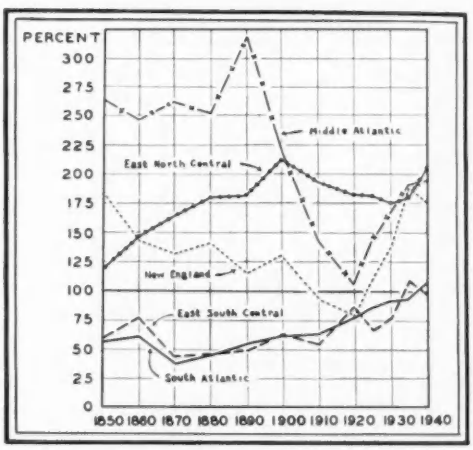


FIGURE 5.—Average values of farm realty per acre in the West (national average value per acre equals 100). The national average value of farm land and buildings per acre advanced, as may be inferred from Figure 3 (bottom section), from $11.14 in 1850 to $69.38 in 1920, fell to $31.16 in 1935, from which it advanced to $31.71 in 1940. In terms of this shifting national average, 1850 found three of the four Western divisions with average values per acre about half as high as the national, and the other division, the Pacific, had an average less than 15 per cent as high. The Pacific division average advanced more markedly and consistently than any other in the entire country. The Rocky Mountain division attained its highest relative average in 1880. The West South Central division average has shown rather consistent advance since 1870. The West North Central division, after leading all Western divisions from 1900 to 1920, took a marked setback from 1920 to 1940, but was still slightly above the national average at the latter date. In general, there has been a widened range since 1850 among Western divisions in average values per acre.

CHANGE IN WESTERN FARM REALTY RELATIVITIES

By contrast with the eastern divisions, those west of the Mississippi have shown in their valuations per acre a tendency to spread away from the national average since 1910, since 1880, and, in fact, since 1850 (Figures 5 and 6). Ranging from 14 to 57 per cent of the national average in 1850, a spread of 43 points, these divisions in 1940 ranged from 29 to 160 per cent of the national average, or 131 points.

The western divisions had valuation averages diversified in their trends. The Pacific division average was 13 per cent of the national average in 1850 and 160 per cent in 1940, an extent of upward movement not paralleled by any other division. The Omaha division showed an almost equally marked upward movement prior to 1920 for 50 or more years. The downward trend in Omaha division relative to the national average from 1920 to 1940 was more marked than in any of the three other divisions that showed a similar trend. The inclusion in the farms of the Omaha division of land of lower average price and the effects of adverse weather in the 1930's doubtless contributed to the downward trend following 1920.

Why have the averages of western division shown increasing spread from the national average during the 90 years in which the eastern division averages

TABLE 2

FARMS, ACRES IN FARMS, AND VALUES OF FARM LAND AND BUILDINGS, TOTALS AND AVERAGES, 26 STATES EAST OF THE MISSISSIPPI RIVER, 22 STATES WEST OF THE MISSISSIPPI RIVER, AND TOTALS AND SELECTED AVERAGES FOR THE UNITED STATES, 1850–1940 (BASED ON UNITED STATES CENSUS)

		1940	*1935*	*1930*	*1925*	*1920*	*1910*	*1900*	*1890*	*1880*	*1870*	*1860*	*1850*
Number of farms (in millions)	Total	6.1	6.8	6.3	6.4[a]	6.5	6.4	5.7	4.6	4.0	2.7	2.0	1.5
	East	3.5	3.9	3.6	3.7	3.9	3.9	3.7	3.1	2.9	2.1	1.7	1.3
	West	2.6	2.9	2.7	2.6	2.6	2.4	2.0	1.5	1.1	.6	.3	.2
Land in farms (in hundred millions of acres)	Total	10.6	10.6[a]	10.1	9.2	9.6[a]	8.8	8.4	6.2	5.4	3.9	4.1	2.9
	East	3.3	3.4	3.2	3.2	3.5	3.7	3.7	3.5	3.5	3.1	3.2	2.6
	West	7.3	7.1	6.9	6.0	6.0	5.1	4.7	2.7	1.9	.8	.9	.3
Value of land and buildings (in billions of dollars)	Total	33.6	32.9	47.9	49.5	66.3	34.8	16.6	13.3	10.2	7.4	6.6	3.3
	East	15.6	14.3	19.6	21.3	27.7	16.3	9.5	8.6	8.0	6.3	5.8	3.1
	West	18.0	18.6	28.3	28.2	38.6	18.5	7.1	4.7	2.2	1.1	.8	.2
Acres per farm	East	93	88	90	87	91	93	100	113	121	145	183	193
	West	284	246	245	229	240	211	220	183	159	184	288	300
Value of land and buildings per farm (in thousands of dollars)	East	4.4	3.7	5.5	5.7	7.1	4.1	2.6	2.8	2.8	3.1	3.4	2.3
	West	7.0	6.4	10.4	10.7	15.3	7.6	3.3	3.1	2.0	2.1	2.5	1.6
Value of land and buildings per acre (in thousands of dollars)	East	47.2	41.7	61.4	65.5	77.5	44.4	26.0	24.7	22.8	20.6	18.4	12.0
	West	24.7	25.9	42.3	46.7	63.9	32.4	15.0	16.9	12.5	11.6	8.8	5.4
Acres per farm as per cent of the average for the U. S. A.	East	53.4	56.6	57.1	59.9	61.2	67.4	68.3	82.9	90.8	94.8	91.7	95.5
	West	151.7	159.0	156.3	157.7	161.9	152.9	150.4	134.4	118.7	119.8	144.3	148.1
Value of land and buildings per farm as per cent of the average for the U. S. A.	East	80.0	75.8	72.2	73.3	69.5	75.5	89.4	96.3	108.6	107.2	111.4	102.4
	West	127.3	132.1	136.4	137.6	149.1	139.7	114.3	106.6	78.2	76.0	77.4	72.3
Value of land and buildings per acre as per cent of the average for the U. S. A.	East	148.9	133.9	126.6	122.4	111.7	112.0	131.0	116.1	119.6	113.0	112.7	107.4
	West	77.9	83.1	87.2	87.2	92.1	81.8	75.9	79.5	65.9	63.5	53.6	48.8

[a] Apparent discrepancy in total results from cutting off figures.

have drawn together? The explanation for the western spread doubtless lies in the increased realization of the economic rôle that each division could play in producing for its own population and for the markets opened to it in other divisions and in other countries by developed shipping facilities.

EXPANSION AND CONTRACTION OF FARM AREA AN INFLUENCE ON VALUATION AVERAGES

Where land has been abandoned, the lowest valued units in the area have usually been dropped first, thus serving, like the dropping of ballast, to keep the average valuation of the remainder higher than it would otherwise be, even possibly raising the average.

Where land is being brought from non-farm into farm use, a reverse tendency is sometimes to be observed; namely, the county, state, or division average is likely to be held down because of the addition of low-valued units to units of higher current valuation already reported as farm land at a preceding census. Much of the decrease in relative valuation of land in the Rocky Mountain division between 1880 and 1900, and again from 1910 to 1925, was traceable to that influence. Within individual states much farther east, there are districts in which the diluting effect of inclusion of lower-valued land was revealed in halted advance in the averages or in actual declines. Where such added areas required a discount at the time of their annexation to farms so as to allow for costs of waiting and of reclamation by drainage or irrigation, the immediate effect was to depress the average no less markedly than where the newer land taken in was of such quality as to be destined to remain subaverage.

HAS THE WESTWARD MOVEMENT BEEN REVERSED?

The more recent manifestations of growth in eastern divisions in numbers of farms, in valuations per acre, and in some other respects, may be viewed as a short-time reaction to depression conditions, or as a turn in a long-term trend. Certainly the back-to-the-land movement has been most active in divisions east of the Mississippi River. In some of its aspects it has carried into farm classification low-grade land which should have been the last to be included.

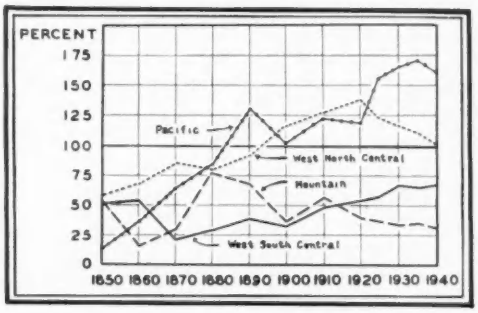


FIGURE 6.—Average values of farm realty per acre in the West (national average value per acre equals 100). This figure should be examined by comparison with Figure 5. Whereas the average values of farm realty per acre in the Western divisions showed a tendency toward dispersion across the 90 years, the Eastern divisions followed that tendency only until 1890. The South Atlantic division average advanced from about 40 per cent of the national average in 1870 to the full level of the national average in 1940. Substantially, the same applies to the East South Central division, which likewise suffered economic disturbances during the 1860's.

The Middle Atlantic and the East North Central divisions both showed extensive rise in values relative to the national average from 1850 until a peak was reached, the former in 1890 and the latter in 1900. Even though the Middle Atlantic land values remained relatively stable in absolute figures per acre prior to 1920, they showed a marked decrease in terms of the rapidly rising national average. The East North Central states showed gradually declining relative averages to 1930, but in 1940 their average was back practically at the 1900 peak. The New England division average showed marked downward trend from 1850 to 1920, and rose sharply from 1920 to 1935, attaining a higher level than in the previous 85 years. The Middle Atlantic division average also advanced sharply from 1920 to 1935, the result, likewise, of steady absolute values in a period of marked decline in the country in general.

Community facilities are sometimes tolerable in eastern sections of relatively poor land. To make a move from city to near-by country is psychologically easier, even though not necessarily so much less expensive, than to make a move from a city to a remote rural area. Bidding up valuations for farm real estate near cities under conditions of urban distress is not a matter for criticism of individuals. If after weathering the storm there is a tendency once more to abandon this property, and in a few years to return to cities, it may seem that the temporary filling up of eastern substandard tracts may be a sound social adjustment. If the back-to-the-land movement ceases to be a temporary adjustment for any considerable proportion of those who take part in it, because of their having to finish out their lives where they thought of themselves as taking refuge during a period of economic storm, a different story arises.

Indications of a certain amount of halting in the speed with which western divisions have been expanding relatively to eastern divisions must signify that there is now confronted long-time adjustments in finance, transportation, and many other lines of economic activity. Location near population centers is likely to continue to be a matter of importance to farmers, not only from the standpoint of part-time employment of farm family members, but also from the standpoint of producing and marketing dairy and horticultural products for direct human consumption. Farm real estate developments are likely to take place with balance favorable to the East, at least until there shall have been effected marked changes in arts of producing and marketing foodstuffs and agricultural raw materials, or until foreign use of products such as western farming has contributed more naturally than eastern farming shall recur.

SAND DUNE STABILIZATION ON CAPE COD

Karol J. Kucinski and Walter S. Eisenmenger

LIKE many other states, Massachusetts is affected by wind erosion and sand dune formation in parts of its area. Massachusetts was perhaps the first state in this country to institute control methods for wind erosion and stabilization of its sand dunes. Sand areas at the extremity of Cape Cod are approximately 6,000 acres in extent. History avers that most of these areas, especially those enclosing Cape Cod Harbor, were originally forested and have been extensively denuded during the country's colonization period. As far back as 1714 and particularly in 1826, extensive reclamation of sand areas on the Province Land was attempted, for Provincetown, the largest city on Cape Cod was in danger of being swept into the sea.

FIGURE 1.—Panorama of typical scene at the Province Land at Cape Cod. A complete change of surroundings to the many tourists who come yearly from inland.

At the time, Provincetown was a thriving port noted for its fishing and commercial shipping. The strong, raw gales which swept across the Cape then, as they still do, carried sands from behind the town into its harbor, while along the shore the sea washed the beaches away into the water. Towns-

FIGURE 2.—Detail of blowing sand, binding grass and shrub, low profiles and barren coast, that give distinction and unique landscape to the Lower Cape.

FIGURE 3.—The Cape Cod dune areas are constantly under observation for active sand dunes. The use of a saddle horse is imperative in the supervision of the dunes.

folk and tradesmen were justly concerned over the hazard to their town and harbor. They requested the Commonwealth of Massachusetts to appoint a commissioner to investigate the danger and make recommendations. Soon money was appropriated to plant a "curious" grass and laws were passed prohibiting cattle, horses, and sheep from roaming at large and destroying it. This special beach grass had extensive roots which would grow to a great length and depth and hold the sand so that neither wind nor water could take it away. This grass rooted quickly, thus checking the movement of the sand, and from that time on the City of Provincetown has been protected, remaining thus to become one of the spots frequented by summer tourists from all over the world.

Cape Cod, which includes all of Barnstable County, has a topography which ranges from sea level to about 150 feet above sea level, with gently rolling lowlands. Geologists have not been able to find bed rock anywhere at the Cape for this outstretched arm is a moraine left behind by the receding glaciers. It is in reality the right arm of Massachusetts, extending 75 miles out to sea, with its shoulder at Buzzards Bay, its elbow at Chatham, and its finger at Provincetown, virtually beckoning to those on the mainland of the Commonwealth to come to her shores and enjoy nature's bounty and observe the diversified farming that takes place on the Cape.

The soil is generally sandy in texture, with very good drainage. With the exception of the cranberry industry, the agriculture of this section is not intensive, with small fruits, strawberries, and vegetables predominating. However, such crops as sweet potatoes, peanuts, cultivated blueberries, beach plums, and asparagus are grown with success. About 70 per cent of the world's supply of cranberries is grown in Massachusetts with Barnstable County producing over 25 per cent of this. Besides cranberries, the beach plum, and the famous straw-

FIGURE 4.—Horsecarts are still used in hauling branches to the active dunes, though the truck is taking their place.

FIGURE 5.—Light trucks equipped with "jumbo" balloon tires used to haul branches to the active dunes.

FIGURE 6.—Pine branches used for stabilizing Cape Cod sand dunes until vegetation can be established.

berries, Cape Cod has another crop which is native to it, namely, the white variety of turnip. When the light strain of seed is used and the crop properly cared for, the flavor, texture, and quality cannot be equalled.

Of late years, a large percentage of the inhabitants of the Cape have been dependent on the flourishing summer tourist trade for their livelihood.

Wind erosion on the Cape as well as water erosion is very severe. In the region between Orleans and Provincetown any agriculture whatsoever is impracticable. Most of the section is occupied by summer resorts and recreation. The remainder of Barnstable County is fairly well in sod and only the north and south shores show any excessive sand dunes.

The most spectacular wind erosion and sand dune formations are found at the Province Land which comprises the area at the extremity of the arm. Figures 1 and 2 illustrate a typical panorama of the Province Lands. This landscape of low, wind-stunted plants fresh green in summer, wonder-colored in autumn and sparsely covered sand dune formations is a main attraction for the many folk who visit the region. The beauty of the dunes is really an asset and they are not considered, therefore, an economic liability despite their low agricultural potentiality. However, this asset would not remain long if continuous measures were not taken to stabilize the active dunes and keep the shifting sand from burying the highways, beaches, and existing shrubbery. From the very earliest times the state of Massachusetts has had jurisdiction

FIGURE 7.—American or native beach grass (*Ammophila breviligulata*) found commonly on Cape Cod. Circular pattern made in the sand by the drooping leaves is characteristic of this species. *Courtesy of Henricks Hodge.*

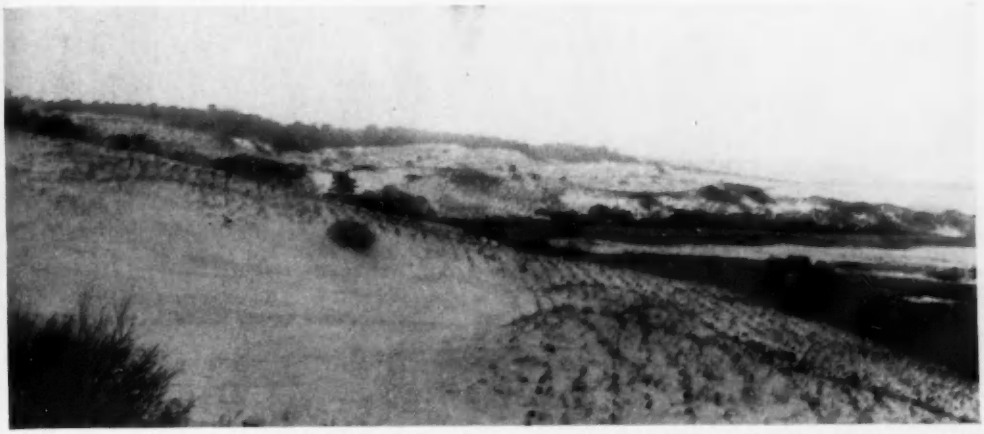


FIGURE 8.—Showing a sand "blowout" with a newly planted stand of Austrian pine around it. It is inadvisable to make tree plantings in the "blowout" areas until they have been fully stabilized with pine branches and beach grass.

over the Province Land and in more recent years, under the direction of the State Department of Public Works and its superintendent of the Province Lands, various methods have been used with success in controlling the shifting sands and establishing permanent vegetative cover. Because of the lack of roads and the inaccessibility of the area by any other form of transportation, men on horseback patrol the whole area and are constantly on watch for active blowouts (Figure 3).

The most severe winds occur during the late fall and winter. As a means of control for the very active sand dunes, pine branches are usually spread on the northwest ("blow" or "live") side of the dune. It is necessary to haul the branches to the dunes either by horse-cart or light truck equipped with specially built oversize, low pressure, "jumbo" tires (Figures 4 and 5). These branches serve as a barrier against the wind and as a shelter which catches beach grass (*Ammophila sp.*) seed (Figure 6). The beach grass seed which usually is quite plentiful, will

FIGURE 9.—A plantation of Pitch pine on what was formerly an active dune area.

FIGURE 10.—Young plantation of Austrian pine in foreground, for control of wind erosion on Cape Cod. What appears to be "bushes" in the background are tops of living trees. Some have been uncovered and have been found to be 12 inches in diameter at the trunk.

germinate and establish the grass during the next season. It is characteristic of beach grass to thrive where there is an occasional deposition of sand over the entire site. If no sand is deposited over the beach grass the plants may do exceptionally well for three or four years and form a thick mass of roots which seems to "choke" off further growth and cause the beach grass to die out. Frequent deposition or drifting-over of sand permits the roots of the plant to establish itself in the new horizons and thus propagate itself almost indefinitely. There are two species of beach grass: European beach grass (*Ammophila arenaria*) originally found along the coast of Europe and later introduced on Cape Cod and on our Pacific Coast; and American beach grass (*Ammophila breviligulata*) which is native along the shores of our eastern coast and the Great Lakes. This latter species differs from the *arenaria* in that it has very short ligules and its leaf blades have a marked tendency to bend or droop. This leaf character makes it easy to distinguish the American species from the European, since the drooping leaves make a very picturesque circular pattern in the sand when they are blown about by the wind (Figure 7).

It is not desirable to make any plantings of trees until beach grass is well established. Usually after two or three years beach grass will have spread itself sufficiently over the sand to prevent any further occurrence of serious blow-outs. When this stage has been reached, pine trees can be planted safely. Three to five year old pine trees planted in

FIGURE 11.—The pine trees once established soon produce an exceptionally large spread of roots near the surface of the ground. With the exception of the top three to five inches, there is normally plenty of water in the sand at Cape Cod.

FIGURE 12.—The characteristic way in which hog cranberry adapts itself for controlling erosion on Cape Cod.

FIGURE 14.—Dusty Miller, found abundantly on the Cape, aids considerably in the natural stabilization of sand dunes.

rows about three feet apart and with three foot spacing in the row, are used. The common practice is to plant the pines in the early spring when there is sufficient moisture present in the sand. Trees planted in late fall or winter have not withstood the cold winds and usually are winter killed. Various species of pines, such as Scotch pine (*Pinus sylvestris*), Mungo pine (*P. mughus*), and Pitch pine (*P. rigida*) have been used effectively in establishing permanent cover over the dunes (Figures 8, 9, 10, 11). The Austrian pine (*P. austriaca*) has been found to be preferable to the Scotch pine in this region for it withstands the cold winters of the Cape much better than any other tree tried. It has been observed on different plantations of Scotch pine which are located on the Cape that during the winter months the prevailing northwest winds when laden with sleet and sand cause a mechanical injury to the pine branches on the windward side. This injury is not as great on the Austrian pine. It seems probable that one of the reasons why the Austrian pine can withstand "windburn" due to the severe winds, is because the bark on its younger branches and twigs is considerably thicker.

In certain localities on the Cape, especially on the Province Lands, where the wind tends to blow out the embankments of the roads, it has been found

FIGURE 13.—Scotch Broom planted along roadsides at the Cape to prevent wind blowing away road embankments.

FIGURE 15.—Black heather, a native plant found covering sand dunes which are fairly well stabilized. *Photo by W. R. Van Dersal.*

expedient to sod a continuous strip, with either hog cranberry (*Arctostaphylos Uva-Ursi*) (Figure 12) or beach grass, two to three feet wide and parallel to the edge of the road. In some instances a thick layer of native beach grass hay, spread on the active wind-blown road embankment has acted as a protection against further blowing as well as a protective mulch for germinating the seed that is present in the hay and also the seed that is blown from elsewhere. Plantings of Scotch broom (*Cytisus scoparius*) along the roadside embankments have given erosion control and at the same time are improving the appearance of the landscape (Figure 13). Two native plants commonly found on the Cape, which produce a desirable cover as well as adding to the aesthetic surroundings are dusty miller (*Artemisia Stelleriana*) (Figure 14) and black heather (*Hudsonia tomentosa*) (Figure 15).

FIGURE 16.—A fruiting branch of the bayberry plant found abundantly on the Cape. Residents pick the berries and sell them for about $70 per ton. The thick coating of wax on the bayberry is used in the making of special scented candles. Birds eat the berries and thus obtain considerable heat energy which helps them to withstand the cold. *Photo by W. R. Van Dersal.*

FIGURE 17.—Showing the general habit of the beach plum on sand dune. The dead plants in the background resulted from sand deposition. Residents pick the fruit to make a special jelly. *Photo by W. R. Van Dersal.*

Seed of Scotch broom and such native plants as beach pea (*Lathyrus maritimus*), sumac (*Rhus glabra, R. typhina*), when sown broadcast on the sand in places where the wind is not too intense, germinate and produce a very desirable cover. Considerable success has been experienced in transplanting native bayberry shrubs (*Myrica carolinensis*) (Figure 16) to form a protective, marginal

FIGURE 18.—An exceptionally well-developed podsol soil found at Wellfleet, Mass. The bleached siliceous layer is 36 inches thick in places. The chemically cemented, mottled brown "ortstein" layer found just below the bleached layer is very hard and cannot be easily disturbed with the point of a shovel.

FIGURE 19.—Faint but definite remnants of a "fossil" podsol horizon are revealed in the wind-blown gap in a well stabilized dune on the Lower Cape. The arrows point to the outcrop of the rather well-developed humus layer.

planting which serves as a windbreak in places where the wind has started to expose roots of previously planted trees.

The beach plum (*Prunus maritima*) (Figure 17) although growing wild in this region, is regarded as a valuable plant since a distinctive jelly is made from the plums. It is common on the older sand dunes and being very hardy, will withstand considerable deposition of sand before it will die. However, the beach plum is a host to many insects which are harmful to more desirable types of trees, and should be used with care, if at all, for protective purposes in sand dune control.

Although it is not very commonly known, the soils of a considerable area on Cape Cod are well developed podsols. It is not uncommon to find a layer four to eight inches thick of highly siliceous material developed in the top soil ("A" horizon) due to the excessive leaching action of the decomposing organic matter that has accumulated on the surface. In one locality at Wellfleet a record thick bleached layer of 36 inches can be observed (Figure 18).

FIGURE 20.—A conspicuous outcrop of the humus layer of an old podsol horizon is buried in the shifting sands of the Lower Cape. The dark band of humus beneath which is a typical whitish-gray bleached siliceous layer, and deeper the hard, chemically cemented mottled brown "ortstein" layer.

Since the processes of podsolization require numerous decades, the presence or absence of a podsolic profile can be used as a criterion in determining whether a certain dune area has been subjected to a recent wind erosion or whether it is stable. In many cases remnants of podsol profiles show that certain very old, stable sand dunes have been recently blown away. The accompanying pictures (Figures 19 and 20), illustrate a typical area where an old dune has recently been blown away, eaving remnants of the old podsol profile. The arrows point to a well developed humus layer, below which is found a typical whitish-gray bleached siliceous layer. Below this bleached layer is found the characteristic, chemically cemented, mottled brown "ortstein" layer. Dune areas have been found where two or three distinct podsol layers are located several feet one above the other showing that in the distant past well stabilized dunes were covered over with new deposits of sand which in turn became stabilized before additional deposits of sand accumulated over them.

BOOK REVIEWS

WHITE, C. LANGDON, AND FOSCUE, EDWIN J. *Regional Geography of Anglo-America.* Prentice-Hall, Inc., New York, 1943.

In the "Regional Geography of Anglo-America," the authors, by their very title, have emphasized the distinctive difference between the Americas north of the Rio Grande and those south of that river. It is a distinction by which many facts that constitute other differences between the two regions may be explained; unquestionably the distinction is one of great geographic significance, as well as cultural consequences. Whether or not it be wise and politic to emphasize the distinction, even by implication as this book does, may be of questionable political value, but there can be no doubt that it serves an excellent geographic purpose. Emphasis upon the difference between the two regions is one of the features of the book, not that the difference is expanded in the text, but merely expressed in the title.

The second service of major import, and directly expressed in the book, is the distinction between regionalism and sectionalism, though a great deal more might have been said than the space of the book permits; in this connection the frank statement of the difficulties arising from the regional approach to a science, which follows the brief comparison of sectionalism versus regionalism, is of much value to the student. There may be some question as whether or not so much definition and explanation at the very beginning of a textbook is desirable, but it does seem essential to the justification of the regional treatment which the authors have selected as their method of approach to the geography of Anglo-America.

The text of the book itself is comprehensive and detailed, and includes a vast amount of material directly a part of, or related to, the subject matter of geography. The comprehensive material has been well organized, well correlated and well interpreted. It constitutes a veritable bonanza of geographic lore, so exhaustive in detail that it requires almost 900 pages close-set type, well-selected half-tones and well-prepared charts, to present it all. The intelligent student who has the good fortune to use the book will have a breadth of geographic knowledge far beyond that of the average American. Few geographic texts have been so inclusive and so exhaustive.

Most of the charts are very well done and bear a significant relation to the text with which they are incorporated and which they serve to illustrate. Almost without exception, the line drawings are well done, both from the geographic and cartographic points of view. The half-tones, which apparently have been chosen with great care, and which serve to emphasize the most salient elements of the text are relatively not quite so good, certainly not so clear as the charts and graphs, either because the grid was not well adapted to the paper or because the paper would not take the proper grid. This "blurriness" of half-tones detracts from the visual excellence of many pages, though in justice it must be said that it does not materially affect the text value of the book.

The index is exceptionally well prepared. The footnotes germane to any part of the text, are placed as near to that text as possible, and reference citations, though from a multitude of sources, are compact, and reduced to an admirable minimum for a textbook. Mechanical makeup is good, the purpose of the book is sound, and the material is valuable and comprehensive. It is a book that will find wide use both as a text and as a reference.

LOVERING, T. S. *Minerals in World Affairs.* Prentice-Hall, Inc., New York, 1943. Price $4.00.

Though a considerable number of books on the general subject of the relation of minerals to world affairs has been published in the last twenty-five years, there is still a great deal to be said on the subject, chiefly because most minerals are exhaustible resources, and the picture changes from decade to decade. Though the first World War served to emphasize the role of minerals in war industry and war strategy, the full significance of the role they play did not emerge until this present global war became imminent. It is chiefly because this new book is up-to-date, that it is so valuable and merits inclusion on the shelves of every library, and in the study of every geographer as well as geologist.

The only criticism of the book that the reviewer has to offer is the omission of sulphates, nitrates, phosphates, and similar important materials, from the discussion of minerals of vital significance in world affairs. Sulphuric acid, one of the most important elements in our industrial economy, must be derived from mineral sources, and in war when explosives are of such essential importance, the sources of nitrogen deserve particular attention. The critical significance of phosphates, borates, and similar compounds derived from minerals, is well established and should not be ignored, it would seem, in a book of this kind. However, on the whole, the book is well organized, well written, and valuable.

W. E. E.

TAYLOR, GRIFFITH. *Australia.* E. P. Dutton & Co., Inc. Price $6.00.

In the revised second edition of his monographic book on Australia, Griffith Taylor makes some changes and additions that add value to a book that was already invaluable to the geographers of the world. With these changes his authoritative discussion of Australian geography becomes complete, and as correct as a man can make it. The original edition at the time of its issue constituted a distinct contribution to the literature of geography and it still remains so, valuable, to student and statesman,

to layman as well as professional man, and to all geographers and other scientists to whom geography is important. The numerous charts and graphs which characterize the first edition remain an equally important and valuable part of the new edition. They have been changed very little.

It is not likely that a geography of Australia superior to this volume will be produced for decades to come. So inclusive and so authoritative is the book, that little remains to be said about the geography of Australia, and only the developments that time produces will necessitate changes in the book. It will remain for many years to come, as it has been since its first issue, the outstanding text on Australia.

W. E. E.

PLATT, ROBERT S. *Latin America: Countrysides and United Regions.* McGraw-Hill Book Company, Inc., New York, London, 1943. Price $5.00.

"Latin America: Countrysides and United Regions" is one more excellent book on the subject and the field. As the author states in outlining the project, "This book is a collection of simple field studies in a frame of complex generalizations. It is not a complete geography of Latin America, though its purpose is to enlarge geographic understanding." . . . "The book has a twofold objective: (1) to contribute to the geographic record some facts and concepts needed for a comprehensive understanding of Latin America but not found in the library when this search began; (2) to contribute to geographic method some evidence on the problem of field study for regional understanding."

The author bases his material upon extensive field studies in many parts of the region which he takes as his field of research. He has personally visited and studied most of the countries and islands about which he writes. His knowledge is first-hand. He has been careful in his selection of the material that he has gathered for presentation. He has studiously kept in mind a definite objective, and sorted and graded the material that he has felt important and germane that it might be wrought into an integrated and trustworthy picture of Latin America. Needless to say he has succeeded in his purpose, and his book derives its particular value from the fact that he has so critically eliminated the irrelevant and judiciously selected for correlation and integration, as well as interpretation, the significant elements that make the geography of South America so interesting and so important.

The author writes extremely well—he achieves clarity and unity in outstanding measure, well beyond most authors that are writing in geography. The few typographical errors that reveal themselves only serve to emphasize the scrupulous care which the author has taken in writing the book. Not only in the material he presents, but in the way he presents it, does the author indicate his long experience and training in the methods and field of geography. He is essentially a field and research man; this product of his years of investigation achieves its great value because of this fact. Its value is enhanced by the careful, yet fluent, style in which he expresses himself.

Platt's "Latin America" will very soon find its place among the indispensible references on Latin America. There is no question that it deserves such recognition. Among the colleges and universities of the country it should be one of the most popular textbooks on the field that it covers. It is excellent in its scholarship, in its style and in its text. Its illustrations are numerous and pertinent, its half-tones being particularly valuable, and its maps, graphs, and charts highly illustrative. Its physical make-up is a credit to the publishers, as its text and style are to the author. At this time, it has exceptional value.

W. E. E.

DALY, REGINALD ALDWORTH. *The Floor of the Ocean.* The University of North Carolina Press, Chapel Hill, 1942. Price $2.50.

Of primary interest to the geographer in one of his basic elements of geographic conditions, the ocean and its effects, Reginald Daly's latest contribution to geomotology "The Floor of the Ocean" is one of the most recent significant books in the field. While of most importance to the geologist, this phase of geomotology has implications of first rank for the geographer as well. Three chapters comprise the book, all of them fascinating in their implications to the geographer: "Foundations of the Great Deep; Submarine Mountains; and Continental Terraces and Submarine Valleys."

The book is written in Professor Daly's best style, so well known among his colleagues as being of exceptional clarity, logic, and force, and this fact enhances the value of the book. The book is well printed on high-grade paper that has no glare and which affords the greatest legibility to the very satisfactory type that has been used. It is well bound. The illustrations are attractive and convincing. The index is inclusive. All in all the book is an excellent example of scientific literary and typographic craftsmanship.

W. E. E.

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